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WESTERN DEVELOPMENT DIVISION

development plan

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WS 117 L

ADVANCED RECONNAISSANCE SYSTEM

REVIEW ON 31 Dec 2006

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DEVELOPMENT PLAN

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Fig. 1

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HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND

2 April 1956

FOREWORD

1. Atomic and hydrogen weapons of enormous destructive power, carried by jet bombers and supersonic missiles, have vastly increased the importance of surprise in modern warfare. Indeed, it is difficult to visualize how an aggressor could achieve true victory except by an overwhelming, unexpected attack. With such surprise, the chances for success are, however, excellent. Unfortunately, the capability for surprise attack rests almost exclusively with secretive, aggressive nations. (~~CONFIDENTIAL~~)

2. These facts give extreme importance to any intelligence-gathering system which promises to significantly reduce the ability of possible enemies to launch a surprise attack against the United States.-- WS 117L is such a system. It makes use of an artificial satellite, circling the earth continuously high above the sensible atmosphere, as a platform from which to gather intelligence regarding activities of potential enemies. (~~SECRET~~)

3. Air Force study of satellite vehicles dates from 1946, when a study by the Rand group indicated the technical feasibility of such vehicles. These studies have been extended to cover the question of military utility. The Rand Corporation, in 1954, concluded that the greatest military value lay in reconnaissance. Extensive further investigation has shown beyond reasonable doubt that: (1) critical components could be developed to function as required, and (2) these components could be integrated into a workable and practical system. (~~SECRET~~)

4. An appropriate development approach has been determined, and the cost of development estimated in considerable detail. Contributions from other programs have effected a tremendous reduction in satellite costs. In particular, the WS 107A program promises to effectively solve the greatest single problem, namely, securing the required orbiting velocity of some 25,000 feet per second. These reductions now leave little doubt that the military worth of a satellite reconnaissance system will amply justify its cost. (~~SECRET~~)

5. The studies of the past ten years and related developments from other programs have been integrated into the development plan presented on the following pages. (UNCLASSIFIED)

6. It is strongly recommended that this plan be accepted and development authorized immediately at high priority. (~~CONFIDENTIAL~~) ✓

Charles H Terhune Jr.
B. A. SCHRIEVER
Major General, USAF
Commander

WS 117L DEVELOPMENT PLAN

2 April 1956

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WS 117L DEVELOPMENT PLAN

2 April 1956

INTRODUCTION

The Air Force is culminating some ten years of study to determine the military utility of a man-made satellite. In 1946 the newly created RAND group was asked by the Air Force to determine the feasibility of placing a man-made satellite on orbit. On the basis of the propulsion technology at that time, RAND's reply to this request was that such an operation would be feasible. There was, however, no determination made of the military usefulness of such a satellite. RAND continued the studies and completed their "Feedback" report, as it became known, in the spring of 1954. They concluded that the conduct of visual and/or electronic reconnaissance is the most promising military use for an early un-manned satellite vehicle, and their final report included a suggested minimum pioneer visual reconnaissance system. ~~(SECRET)~~

Based upon the conclusions reached in the "Feedback" program, the Air Force has been carrying on an extensive study program aimed at determining the magnitude and direction to be taken on a Development Program for a Reconnaissance System utilizing a satellite as a platform for collecting intelligence information. This extensive study by the Air Force was divided into two primary objectives: first, to establish that critical components of this satellite reconnaissance system would in fact be attainable to perform the functions for which they were intended; second, to ascertain if these components could be successfully integrated into a working reconnaissance system. ~~(SECRET)~~

To accomplish the first of the two objectives, a program of separate tasks aimed at determining and advancing the state of the art as required was initiated. RAND, having recognized that critical areas exist, had initiated studies to investigate these areas and to solve the associated problems. The Air Force continued RAND's work and extended it to investigate other critical areas as they were determined to exist. As an example, one of the critical items is that of providing sufficient auxiliary power. Studies were initiated and are still under way to determine the feasibility and best method of providing sufficient power aboard the satellite to operate the reconnaissance equipment. Nuclear reactors to be used as a heat source in the generation of electrical power are being studied, as well as the possibility of utilizing the sun as a source of auxiliary power. ~~(SECRET)~~

Studies have been under way to determine the best method of providing basic inertial guidance and attitude control for the vehicle. The problems associated with the reconnaissance packages themselves have been given maximum attention over the past several years. These include both the problem of the visual reconnaissance using television and film and radiation or ferret reconnaissance techniques. The associated problems of radiation damage from the nuclear reactor and the problem of component reliability under long unattended operation in the satellite's environment also have been studied. Not overlooked have been the problems of acquisition and tracking of an orbital vehicle and the command equipment necessary for use with such a vehicle. ~~(SECRET)~~

Introduction (cont'd)

2 April 1956

The manifold problem relating to the capability of an intelligence agency to utilize the vast amount of intelligence information which is potentially available from this type of system has also been considered. When one considers that a single satellite vehicle of the type described in the "Feedback" report may be capable of producing up to a hundred thousand pictures daily and when one further considers that utilizing such vehicles for surveillance could possibly require numbers of vehicles to be operating simultaneously, one can quickly see that this information would swamp all heretofore known or considered means for processing intelligence information. It has been recognized that the development of such a system would encompass practically every field of science known to the Air Force, industry, and the scientific community in general. The best competence available in these various fields has been fully utilized during these studies. Participating in these studies have been the laboratories and research agencies of the Wright Air Development Center, Rome Air Development Center, and Air Force Cambridge Research Center, and through these agencies the individual study tasks have been functioning either in industry, under contract to the Air Force, or as individual and discrete technical studies "in the house" of the laboratories. (~~SECRET~~)

The second major objective (the problem of integrating the various components both space-borne and ground-based into a workable reconnaissance system) has been attacked. (~~SECRET~~)

In the spring of 1955, design study proposals were solicited from selected contractors from industry. The number of sources solicited was limited by the consideration of maintaining a secure program throughout the design and development phase. This is a reconnaissance system involving the launching of a vehicle into orbit for the ultimate purpose of collection and dissemination of intelligence information. Therefore, the problem of providing an airframe and engines did not need to be the sole guide to the type of contractors to be solicited. These solicitied were the Lockheed Aircraft Corporation, the Radio Corporation of America, the Glenn L. Martin Company and Bell Telephone Laboratories. It will be recognized that there were ostensibly two airframe manufacturers and two electronic manufacturers. The Bell Telephone Laboratories declined to submit a proposal. (~~SECRET~~)

Since the middle of June of last year, the other three contractors have been proceeding with Design Studies. These contractors have studied the entire system. The objective of their studies has been to determine whether a military intelligence system aimed at satisfying the national intelligence requirements of the future can be foreseen at this time with sufficient definitude to indicate full scale development, and to establish the direction and magnitude of the technical programs needed to realize this development. The system was designated to have co-missions: first, it was to provide physiographic pioneer and surveillance coverage of the

USSR and its companions; and, second, it was to be capable of providing and maintaining continuous and comprehensive surveillance of the electronic activities of the Soviet Russia. Involved would be a test program utilizing a satellite vehicle. (~~SECRET~~)

These design studies have culminated in three separate and distinct development plans prepared by the three design study contractors. From these design studies, and from the vast amount of information that has been obtained from the state of the art studies, has evolved the Weapon System 117L Development Plan. (~~SECRET~~)

AF-WP-L-29 MAY 53 5M

~~SECRET~~
SECURITY CLASSIFICATION

RDB PROJECT CARD

TYPE OF REPORT

REPORTS CONTROL SYMBOL DD-RDB(A)48

1. PROJECT TITLE (UNCLASSIFIED) ADVANCED RECONNAISSANCE WEAPON SYSTEM 117L

2. SECURITY

3. PROJECT NUMBER WS 117L

4. INDEX NUMBER

5. REPORT DATE 2 April 1956

6. BASIC FIELD OR SUBJECT Strategic Air Warfare

7. SUBFIELD OR SUBJECT SUBGROUP

7A. TECH. OBJ.

8. COGNIZANT AGENCY Air Research and Development Command

9. DIRECTING AGENCY Hq ARDC Western Development Division

OFFICE SYMBOL

TELEPHONE NO.

10. REQUESTING AGENCY Hq USAF

11. PARTICIPATION, COORDINATION, INTEREST

USAF	USN
AMC-P	CNO-I
APGC-P	USA
ATC-P	C/S-I
SAC-C	Other
ADC-C	CIA-I

12. CONTRACTOR AND/OR LABORATORY

CONTRACT/W.O. NO.

13. RELATED PROJECTS
WS 107A
WS 438L
WS 315A

14. DATE APPROVED

15. PRIORITY 1A

16.

17. EST. COMPL. DATES
RES.
DEV.
TEST
OP. EVAL.

18. FY | **FISCAL ESTS. (M $)**

19.

20. REQUIREMENT AND/OR JUSTIFICATION

The Advanced Reconnaissance System described in this development plan is designed to fulfill the military requirement outlined in General Operational Requirements (80) SA-2C dated 11 March 1955 and System Requirement 5 dated 17 October 1955, stated in the latter document as follows:

"Provide continuous (visual, electronic, or other) coverage of the USSR and satellite nations, for surveillance purposes. Timeliness of receipt of the intelligence information is essential, with daily reconnaissance coverage at high resolution the ideal. In consideration of the requirement for earliest availability of the Advanced Reconnaissance System, the engineering progression and Air Force acceptance should be from the lesser to the greater resolution."

The types of intelligence required, in order of priority are:

1. Strategic Warning;
2. Enemy Military Forces in Being;
3. Enemy Military Stockpiles of Thermonuclear-Atomic Weapons;
4. Enemy Logistics Capabilities;
5. Enemy Industrial War Capabilities.

22. RDB | **SN** | **CN** | **IC & P** | **X.** | **I.** | **C.**

DD FORM 1 JAN 52 613

~~SECRET~~
SECURITY CLASSIFICATION

PAGE B-1 OF PAGES

Improved knowledge of potential enemy capabilities and intentions in the above areas will greatly improve our abilities to conduct peacetime negotiations, to plan our defenses, and to use our weapons if the necessity arises. (~~SECRET~~)

Information on the existence, deployment, and location of all targets will allow for the preparation of more complete strike data and thereby improve the capability of strategic bombardment. (~~SECRET~~)

Ferret data will make possible the advanced development of suitable countermeasures. (~~SECRET~~)

Knowledge of the disposition and nature of defenses will enhance penetration probabilities. (~~SECRET~~)

Technological data acquired can be used in the proper orientation of U. S. Weapon Systems (both defense and offense) and possibly for their improvement. (~~SECRET~~)

Evidence of enemy intention to wage war will provide much needed lead time for mobilization of forces, dispersal of weapons and population and an increased capability for detection of attack. (~~SECRET~~)

Specific warning of overt acts, such as attacks under way, will allow for activation of defenses and counterblows (i.e. WS 107A), and will materially improve chances for survival after an initial attack. (~~SECRET~~)

As a secondary requirement, the USAF has required the provision of a satellite vehicle of greater payload potential than the Vanguard for scientific purposes. (~~SECRET~~)

21a. Military Characteristics

Operational vehicles will be launched from an appropriate location in United States territory. An ICBM will supply the primary propulsion. (See Figure 2). The ICBM booster will fall away on burnout, and an internal power-plant in the orbiting nose section will supply the remaining propulsion required (4-8000 ft./sec.). The vehicle will ascend to an altitude of about 300 miles, where a substantially circular orbit will be established. Internal controls will then erect the vehicle to the proper attitude. The most common orbits will pass within a few degrees of the poles. When the vehicle approaches an area of interest, an internal timer will start the sensing equipment. (See Figure 3). The signals will be received and stored on photographic film, magnetic or electrostatic tape, or some other appropriate medium. ~~(SECRET)~~

The vehicle will continue around the earth, and when within range of a ground receiving station, will begin to transmit the recorded data. The data will be received, processed and transmitted to the using agencies. ~~(SECRET)~~

The vehicle will then begin its next cycle. These revolutions will be repeated at approximately 90 minute intervals. Because the orbit is essentially fixed in space, while the earth rotates inside it, successive passes over the earth's surface will be displaced by approximately 22-1/2 degrees. This offsetting will permit a single vehicle to view the entire earth in a total time period which depends on the width of swath observed. Useful operation will be terminated either when air drag slows the vehicle to where it plunges into dense atmosphere, when the electrical power supply is exhausted, or when failure of equipment takes place. Expected useful life for later systems will be in excess of a year. ~~(SECRET)~~

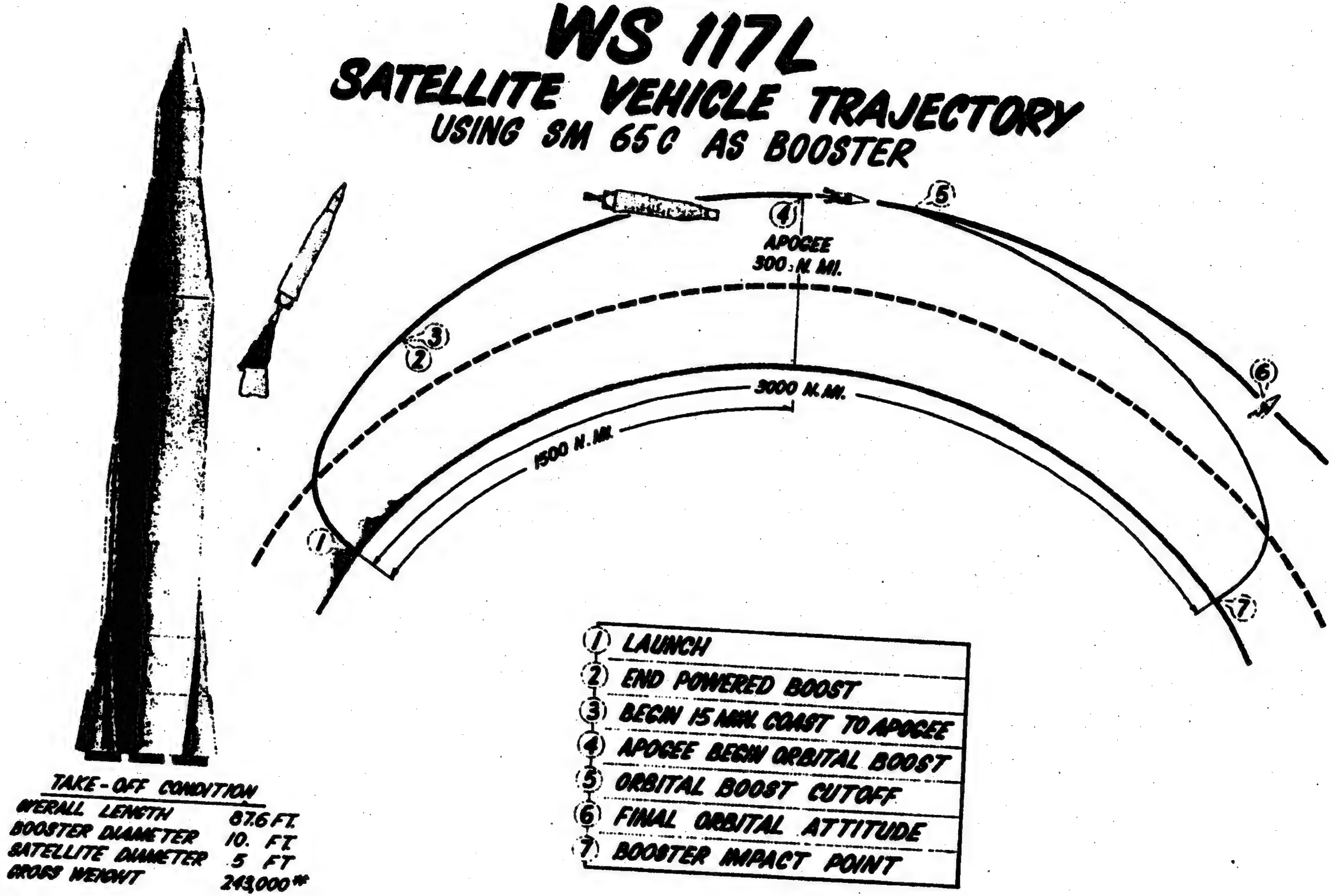
The orbiting satellite vehicles of WS 117L will be equipped with devices for sensing and relaying to the ground reconnaissance information in the radio, infrared, and visible regions of the radiant energy spectrum. The data will be received at a rate that will permit coverage of the entire Soviet bloc by a single vehicle as frequently as once every eight days. ~~(SECRET)~~

It is expected that the equipment will permit the following:

Pioneer terrain and mapping coverage;
Collection of world-wide cloud cover and other weather data;
Detection of new and hitherto unknown targets and verification of known targets;
Determination of electronic signal characteristics;
Location of targets and defenses;
Collection of data on technological improvements;
Evaluation of military and industrial strength;
Monitoring of electronic emissions;
Surveillance of enemy build-up indications;
Warning of attacks under way or pending;
Assessment of high-yield weapons' damage;
Reconnoitering of military movements. ~~(SECRET)~~

~~SECRET~~

WS 117L
SATELLITE VEHICLE TRAJECTORY
USING SM 65C AS BOOSTER



TAKE-OFF CONDITION

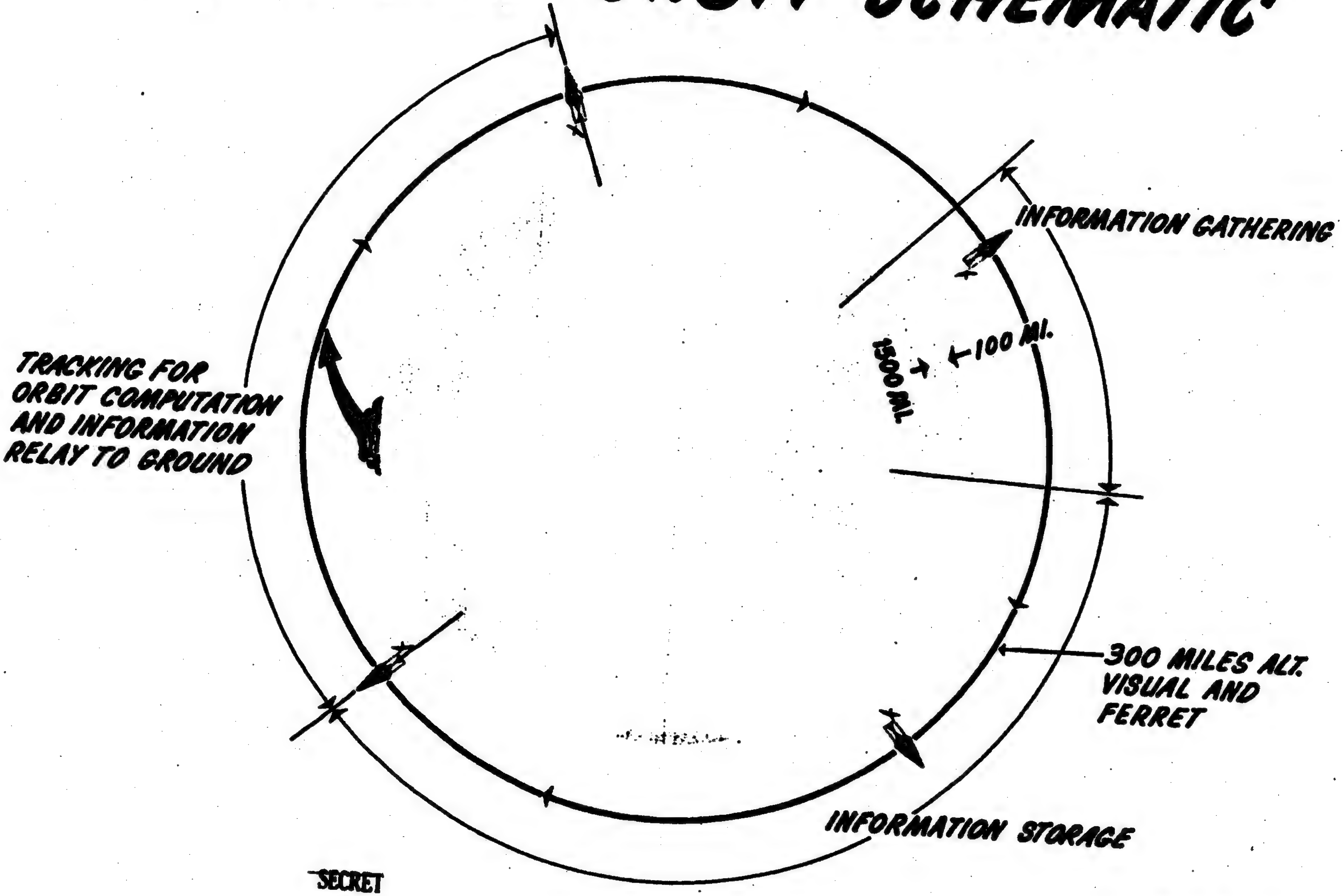
OVERALL LENGTH	87.6 FT.
BOOSTER DIAMETER	10. FT.
SATELLITE DIAMETER	5 FT
GROSS WEIGHT	243,000 #

Fig. 2

~~SECRET~~

~~SECRET~~

SATELLITE ORBIT SCHEMATIC



~~SECRET~~

WDGP 56-0533

Fig. 3

The programs have been chosen and phased to meet two major development objectives:

1. Optimize the development of the operational Advanced Reconnaissance Systems in terms of the best balance between early availability, effectiveness in performing the intelligence mission, and over-all economy in terms of manpower and funds. ~~(SECRET)~~

2. Provide a stepwise series of reconnaissance systems capable of collecting significant visual and ferret intelligence of high priority at the earliest dates. ~~(SECRET)~~

Program I: Early flights will have as their primary objectives: establishing feasibility of orbital operation and collecting basic environmental data relating to the satellite operation. Also, there will be imposed the additional objective of ARS component testing and collection of geophysical data of interest to the scientific community in general. ~~(SECRET)~~

Program II: This program is designed to yield a Pioneer Visual Reconnaissance with a capability of mapping physiographic features at a ground resolution of 100 feet and a locational accuracy of one-half mile. Physical recovery of exposed film may be attempted if this procedure shows promise of providing early information. ~~(SECRET)~~

Program III: This program will be a Pioneer Ferret System capable of providing frequency density information over Russia and Red China in the range from 50 mc/s to greater than 18,000 mc/s. Emission sources operating above 1000 mc/s will be located to within 60 miles. ~~(SECRET)~~

Program IV: This program covers the development of a large scale photographic function with a ground resolution of about 20 feet. ~~(SECRET)~~

Program V: This program leads to the advanced Ferret System that allows for a more accurate determination of signal characteristics in CW as well as pulsed signals. Less than fifty mile uncertainty is anticipated in the location of an isolated signal. ~~(SECRET)~~

Program VI: Program VI leads to development of a continuous visual surveillance system at ground resolutions of 20 feet or better, using high resolution television with video recording or with direct transmission; film cameras with protection from nuclear radiation using shielding or bola-type vehicles, to separate the APU and film, as used with solar APU's; and phototape or some other system with a temporary, reusable image storage medium. ~~(SECRET)~~

Program VII: Program VII is designed to yield an infrared early warning system to afford continuous detection of aircraft and ICBM's. ~~(SECRET)~~

__Program VIII__: Program VIII consists of the development of a surveillance type ferret as well as other specialized electronic reconnaissance systems. (~~SECRET~~)

__Technical Aspects__

In view of the urgency of the program, it is considered mandatory that there be concurrent research and development of both the satellite-borne and ground-based subsystems to insure __maximum military utility and system reliability__. To realize these ends, alternate technical tasks and state of the art investigations will have to be made simultaneously until a specific method is proven. (~~SECRET~~)

It is apparent that in order to satisfy the requirement for an early flight demonstration, it will be necessary to make use of existing components of predictable reliability. The development of the ARS is tailored to make maximum use of equipments, in existence or under development for other systems, which are applicable. (~~SECRET~~)

The contractors' design studies and cognizant agencies within ARDC have determined the feasibility of utilizing other equipment within the military inventory. Some examples are:

1. Use of a WS 107A vehicle (See Figure 2) will fulfill the major portion of the ARS propulsion requirement. An SM-65C (later SM-68) will be used as the __ARS booster__ on a minimum interference basis.

2. The all-inertial guidance subsystem of WS 315A and a tactical bombing inertial system scheduled to be available in time to be utilized in the WS 117L flight test program. Components from these systems can be utilized with a minimum of modification in the design and construction of a complete all-inertial ascent guidance system for WS 117L.

3. Valuable environmental data will be secured through Air Force Cambridge Research Center and other agencies. Requirements for geophysical-environmental data will be placed against the Vanguard program.

4. Acquisition and tracking radar equipment (i.e. AN/FPS-16), under development within other systems, can be used for the ARS applications in the appropriate time period with minor modifications.

5. For the early orbital testing of the ARS vehicle, the engineering of Convair SM-65C Launch Facilities can be adapted, with minor modifications, to fulfill ARS requirements. This will gain time toward satisfying the ARS mission, and provide additional flexibility in both programs in that engineering-wise the launch requirements are similar. (~~SECRET~~)

DD Form 613 (cont'd)

2 April 1956

21c. - SUBSYSTEMS

1. Spaceframe: The vehicle subsystem will consist of the spaceframe structure of the satellite final stage together with the mating details of satellite and booster stages and including tankage design. The approach will be to design the vehicle structure to be compatible with the other subsystems and to serve as a complete structural framework for them. ~~(SECRET)~~

2. Propulsion: For the pioneer systems, the Project Vanguard engine will be used and for the Advanced System a development program will be prosecuted as outlined in the General Design Specification. (UNCLASSIFIED)

3. Auxiliary Power: It is proposed to use silver-zinc primary batteries for pioneer vehicles and test systems. The development of a Nuclear APU and also solar batteries will be initiated for the advanced systems. As a back-up and also as a possible replacement for batteries, a chemical open-cycle APU may be developed. (UNCLASSIFIED)

4. Guidance and Control: In carrying out the development of this system, maximum possible use will be made of existing capabilities evolved by previously sponsored Government research and development in the inertial field. Because of differing requirements, no guidance system currently under development will be satisfactory for guidance of the WS 117L vehicle. A single all-inertial system in the orbiting section appears to be the most promising approach.

5. Visual Reconnaissance: The visual reconnaissance system will be capable of:

(1). Detecting and locating physiographic features of terrain, population centers, airfields, harbors and transportation nets (the Pioneer Systems will be designed to detect objects of 100 foot dimensions and the Advanced Systems approximately 20 feet);

(2). Performing weather reconnaissance with a sector width of not less than 800 miles. ~~(SECRET)~~

6. Electronic Reconnaissance: Three electronic reconnaissance systems will be developed, providing progressively greater frequency coverage as more powerful vehicle power supply systems become available. The final goal is a coverage of 40-40000 mcs. with accurate measurements of the usual signal parameters of interest to analysts. ~~(CONFIDENTIAL)~~

7. Infrared Surveillance: An infrared surveillance system for the satellite promises to provide early warning against attack by manned aircraft and ballistic missiles. It is proposed to conduct an intensive feasibility study in regard to the use of infrared in a satellite; the prosecution of

21c - **SUBSYSTEMS** (cont'd)

7. **Infrared Surveillance** (cont'd)

any associated development program will be contingent on the outcome of the study. For planning purposes, however, this development plan includes all cost and related data covering the development and testing of an infrared surveillance version of the satellite. ~~(SECRET)~~

8. **Ground-Space Communications**:

This subsystem consists of all vehicular and ground electronic equipment required for acquisition, tracking, command, programming, ground-space data links, timing, telemetering and orbit computations. ~~(CONFIDENTIAL)~~

The vehicular equipment includes the beacon-transponder, including "lost bird" beacon facilities, the command receiver and associated time sequencing programmer the reconnaissance data transmitter, an accurate vehicle time standard, a telemetering encoder and transmitter, and destruct circuits. ~~(CONFIDENTIAL)~~

The ground sites will be appropriately located to provide adequate coverage and data readout time for both the test and operational phases of the program. The following equipment will be included at each site: (UNCLASSIFIED)

1. Tracking radar with acquisition features, command transmitter, data receiving and recording equipment, data communication links to the WS 117L Intelligence Center telemetering receiving facilities, and a supplementary orbital computer. ~~(SECRET)~~

2. A master computer will be located at the WS 117L Intelligence Center. (UNCLASSIFIED)

9. **Data Processing and Intelligence Dissemination**:

The data processing and intelligence dissemination subsystem, located in the WS 117L Intelligence Center, will be capable of the functions necessary to insure intelligence and weather information in a form that provides a clear, adequate basis for human analysis and command decision. The end item will be a highly automatic, integrated subsystem which provides equipment for the processing of visual, ferret and infrared data into intelligence information for use by intelligence and command activities. ~~(SECRET)~~

The functional areas necessary to insure construction and availability of information consist of conversion, extraction, indexing, storage, display and dissemination. These will provide intelligence information in the form, frequency and quantity desired by various users. They will become tasks under the Ground Data Handling project and be discussed more in detail under the General Design Specifications, Tab 1. ~~(CONFIDENTIAL)~~

21c. - SUBSYSTEMS (cont'd)

9. Data Processing and Intelligence Dissemination (cont'd)

Operational development of this subsystem will be oriented towards compatibility with, and maximum utilization of, equipment under development for System 438L - USAF Intelligence Data Handling System. (UNCLASSIFIED)

10. Ground Support and Training:

This subsystem involves the manpower, equipment, and appropriate facilities (not peculiar to specific operation or check-out of other subsystems) to test and launch the ARS Orbiting Stage-ICBM-booster combination; also, all training required to provide capable personnel for all phases of the ARS operations. ~~(SECRET)~~

Facilities and equipment will be required at the ICBM Captive Test and Launch Areas during early WS 117L flight testing. To eliminate mutual interferences between the ICBM and ARS programs, a separate ARS launch complex appears desirable. ~~(SECRET)~~

11. Flight Test

Requirement:

The flight test program will provide vehicles, equipment and instrumentation for development of flight testing of the Advanced Reconnaissance System.

In general, test vehicles used will be those developed for other purposes, or will be logical steps leading to the provision of suitable vehicles for the reconnaissance systems. The subsystem will:

1. Obtain geophysical environmental information;
2. Serve as a test bed for ARS subsystem components;
3. Measure performance characteristics of reconnaissance equipment;
4. Test techniques for preparation, launching, tracking and data transmission from a satellite. ~~(SECRET)~~

Vehicles:

Four basic vehicle types will be used, each of which has as its purpose the provision of a vehicle for the evaluation of specific problem areas.

Vehicle components and functions will be tested and geophysical environmental data obtained from a non-orbiting vehicle of limited range and flight duration, such as the Aerobee.

21c - **SUBSYSTEMS** (cont'd)

11. **Flight Test** (cont'd)

Full scale airframe systems will be functionally tested in captive firings of the orbit stage test vehicle, and perhaps by non-orbiting flight testing of this airframe on Redstone or other available missiles.

Satellite systems will be evaluated and any additional geophysical environmental information required will be obtained from long range ballistic flight tests in non-orbiting test vheicles, such as SM-65A missiles.

Operational techniques and problems of satellite flight will be evaluated with orbiting test vehicles. These orbiting vehicles will be as nearly suitable for reconnaissance missions as available design information will permit, in order to minimize "dead end development." Orbiting test vehicles will also be used to obtain orbiting geophysical, environmental, and scientific data which can only be obtained from an orbiting body. (~~SECRET~~)

(Note: Consideration will be given to provision of orbiting test vehicles for the purpose of collecting geophysical data for advancement of the state of the art.) (~~SECRET~~

12. **Instrumentation:**

It is expected that instrumentation on early flights will require the full capacity of the telemeter system to obtain data on environmental conditions (both geophysical and induced) peculiar to the Advanced Reconnaissance System. Later flights will require the instrumentation of the various payload systems to determine their operation in the Advanced Reconnaissance System vehicle environment established by the early flights of each type of flight test vehicle. Information channels not utilized for the prime objective of this stage will be used for obtaining additional geophysical and induced environmental data. (~~SECRET~~)

GENERAL DESIGN SPECIFICATIONS

PART I - GENERAL

A. Statement of Problem

WS 117L fulfills System Requirement No. 5, dated 17 October 1955, by providing an advanced reconnaissance system capable of accomplishing the following missions:

1. Provide pioneer and surveillance physiographic coverage of the USSR and its allies. ✓

2. Provide continuous and comprehensive ferret coverage of the USSR and its allies. ~~(SECRET)~~ ✓

This system will use an earth-circling satellite as a platform for the data collection equipment, and will be operational in the 1960-65 time period. Since there are areas of the USSR and its allies where inadequate intelligence exists, a limited reconnaissance capability must be realized at the earliest possible date. In conjunction with this requirement, there is a secondary, but nevertheless important, need for a satellite capable of securing scientific information uniquely obtainable by a vehicle having a payload capacity in the order of hundreds of pounds.

B. Approach

1. The Advanced Reconnaissance System, WS 117L, consists of all equipment and facilities required to:

   a. Launch, propel and orient a satellite vehicle and its payload of data collecting and transmitting equipment on orbit.

   b. Acquire and track the vehicle at all times when it is in range of a ground station, in order that a contact can be established and maintained and the vehicle's future tracks can be anticipated.

   c. Receive the collected data at a ground station and transmit required commands to the vheicle.

   d. Process, interpret and reduce the collected data and disseminate the resulting useful intelligence. ~~(SECRET)~~

2. The development plan for WS 117L is predicated on the following factors:

   a. Development of the system should proceed from a simple design of limited capability to a highly refined version capable of meeting fully the requirements of System Requirement No. 5. An important trade-off of sophistication for availability is necessitated, if useful, and presently non-existent intelligence data are to be gathered at an early date. (~~SECRET~~)

b. A vigorous, well-funded development program is required, if the formidable problems met in the development of such a unique system are to be overcome. (~~SECRET~~)

3. One test and three operational systems are planned. These systems have different capabilities and will be time-phased to provide an intelligence competence as indicated in 2a above. The four systems are further sub-divided into eight programs and the organization is as follows:

a. Engineering Prototype Test System:

Program I: Early flights will be made to establish the feasibility of orbital operation, to collect environmental data and to test system components and subsystems on an individual basis. (~~SECRET~~)

b. Pioneer System:

Program II: This program is designed to yield pioneer visual reconnaissance with a capability of mapping physiographic features with a ground resolution of 100 feet and a locational accuracy of one-half mile. ~~(SECRET)~~

Program III: This will be a pioneer ferret system capable of providing frequency density information in the band of 50 mc/s to greater than 18,000 mc/s. Emitting sources operating above 1000 mc/s will be located within 60 miles of their geographic position. (~~SECRET~~)

c. Advanced System:

Program IV: A more advanced visual reconnaissance system, which possesses a ground resolution of 20 feet and uses photographic techniques, will be developed. (~~SECRET~~)

Program V: An advanced ferret system, which permits accurate determination of both CW and pulsed signal characteristics, will be developed. ~~(SECRET)~~

d. Ultimate System:

Program VI: A visual reconnaissance system capable of continuous surveillance, and which will have a ground resolution of 20 feet and uses television techniques in conjunction with a reusable storage medium, will be developed. (~~SECRET~~)

Program VII: A system capable of using infrared detection to provide early warning and continuous detection of aircraft and ICBM's will be developed. ~~(SECRET)~~

Program VIII: This program will be for the development of a surveillance ferret reconnaissance system as well as other specialized electronic reconnaissance systems. ~~(SECRET)~~

During the course of development, both the satellite-borne equipment and the ground-based equipment will be time-phased so that they will be operationally compatible. ~~(SECRET)~~

Many of the ground handling and launching equipments will be duplicates of those used by WS 107A and attention will be given to integration of WS 117L's requirements with WS 107A schedules in order to minimize interference. ~~(CONFIDENTIAL)~~

PART II - DESCRIPTION

A. Vehicle

The vehicle subsystem will consist of the space frame, propellant tankage and booster mating structure of the satellite. Vehicle design must meet the following requirements:

1. Provide for the effects of environmental factors, such as drag and gust loading, meteorite bombardment, and thermal and nuclear radiation.
2. Accommodate the different payloads as new items of equipment are developed.
3. Accommodate ICBM boosters for first-stage propulsion.
4. Provide for proper mating and separation of booster and vehicle stages.
5. Accommodate several different auxiliary power units.
6. Optimize equipment packaging to minimize attitude control power requirements. ~~(SECRET)~~

The engineering prototype system will use a vehicle design which most readily accommodates the visual and ferret payloads of the Pioneer Systems. This vehicle will have a cone-cylinder body which will be about 18 feet long, 5 feet in diameter and, including all necessary subsystems, will weigh between 7,000 and 3500 pounds. This permits the use of an unmodified SM-65C as a booster. This vehicle will have non-integral tankage for the third stage propulsion, which will limit the orbital payload. Consideration will be given in the design for degradation of booster performance, which is indicated graphically in Figure 4. ~~(SECRET)~~

Later vehicle design will have a similar configuration, employ integral tankage design, and be adaptable to either a modified SM-65 or SM-68. The weight of the third stage, which mounts on the booster in place of the warhead, will be in excess of 13,000 pounds. This will more than double the weight of the satellite which can be placed on orbit. (~~SECRET~~)

An early, half-scale non-orbiting version of the vehicle may be designed and used to flight test the configuration and full-scale subsystems on an individual basis. This same vehicle may also be used to gather environmental data. A Sergeant-type booster would be the basis for this vehicle design. (~~CONFIDENTIAL~~)

B. Propulsion

The Project Vanguard 7500-pound thrust engine, having a 278 second specific impulse, is planned for the Engineering Prototype and Pioneer Systems. Forces for vehicle flight control will be obtained from two small gimballed engines. Certain additional testing of the Vanguard engine over and above that performed under the Vanguard Project is contemplated under this program in the interest of insuring reliability. As a backup for the Vanguard engine the XLR-81 Hustler engine will be considered, as well as RMI's XF8U turbo pump engine. (~~SECRET~~)

In regard to improved engines for the two latter systems, it is planned to:

1. Conduct a study to determine the necessity for and usefulness of improved performance such as that obtainable from an ammonia-fluorine type engine.

2. Initiate a development program for an ammonia-fluorine-type engine, providing the above study indicates that such development is required. A proposed engine of this type is estimated to be capable of producing 20,000 pounds thrust and 342 seconds specific impulse at altitude. Because of the four year development time required for an engine of this type, the early initiation of any required development is desirable.

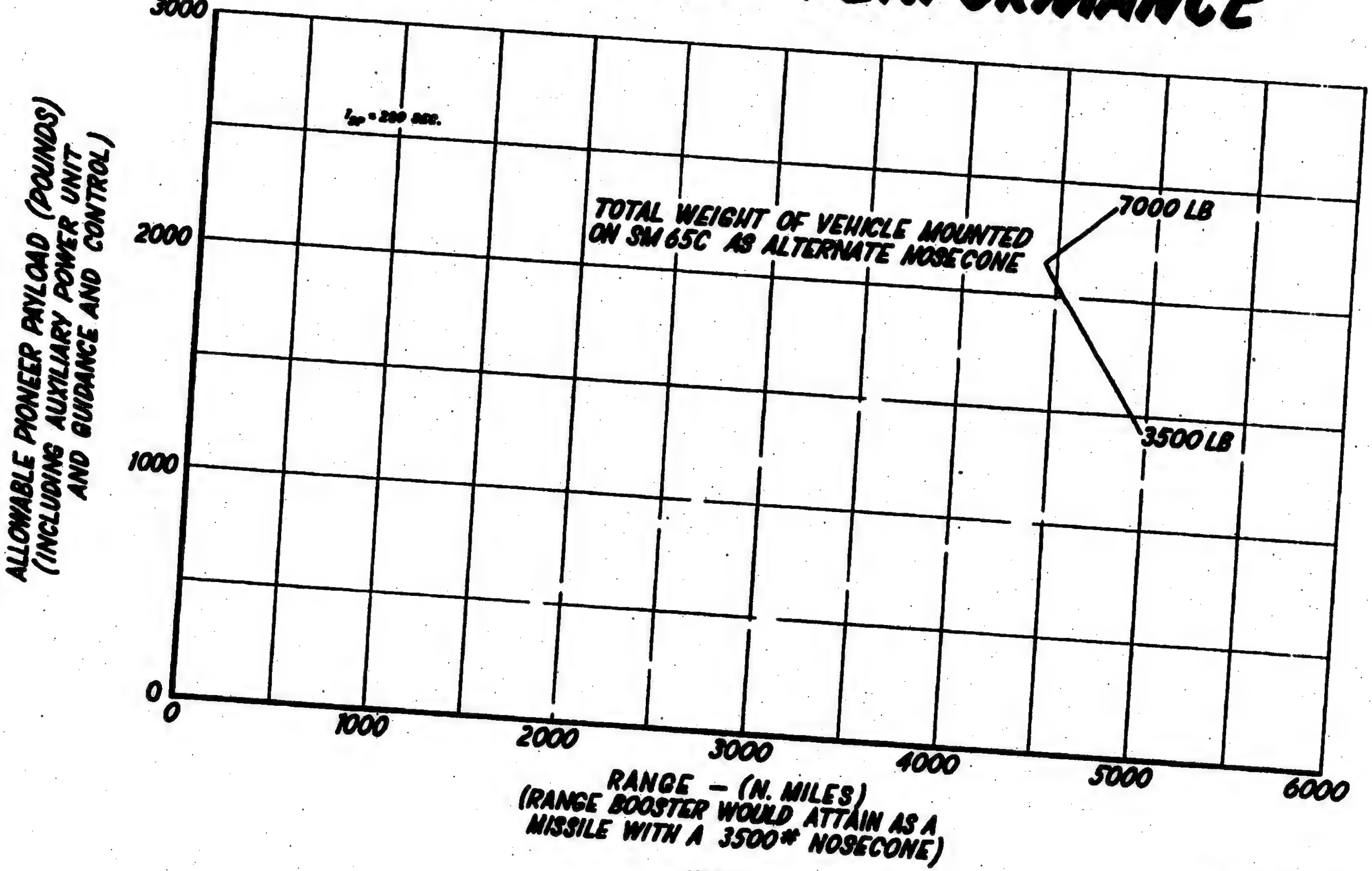
3. Study pump versus pressurized systems as applied to the ARS. (~~SECRET~~)

C. Auxiliary Power Subsystems

The auxiliary power subsystems will include all items of the auxiliary power unit required for furnishing all power to equipments in the vheicle. The power units require: power outputs of from 100 watts to 10 kw, depending on mission application; a minimum of interaction with drag and attitude factors affecting the vehicle on orbit; reliable continuous operation for the useful lifetime; and maximum simplicity of operation with minimum weight. (~~SECRET~~)

~~SECRET~~

PAYLOAD ON ORBIT WITH DEGRADED SM 65 C BOOSTER PERFORMANCE



~~SECRET~~

Fig. 4
Page C-4a

Chemical battery units will provide power for test vehicles and early operational vehicles. Silver-zinc or other silver-alkaline types of primary batteries will be used where possible. Development of secondary batteries will be limited to the extent considered necessary for potential use with solar converters as a power source for operation on the dark side of the earth. (UNCLASSIFIED)

Solar converters will be developed to provide power for vehicle operation, particularly for applications where the loads are from 1/2 to 1 kw. Study of stacked converters will be intensified to determine ultimate power output available for given collector areas. Various types of solar converters will be studied for improving the efficiency of conversion. Studies will be made of environmental effects of meteors and natural radiation on the collector plates to determine degradation rates and useful lifetimes in orbit. ~~(SECRET)~~

A nuclear power unit will be developed under cognizance of the AEC to provide power of the order of 3 - 10 kw for payloads requiring greater power such as the ferret application. Optimization studies will be made to determine the required shielding for vehicle components and the effects on overall vehicle configuration and electronics. ~~(CONFIDENTIAL)~~

Development of a chemical power unit for the gas-generator and turbine type may be conducted as a back-up program for the other types of auxiliary power units, depending on the results of further study. Studies of nuclear energy will be conducted to determine feasibility and desirability of conducting the development of these types of units. ~~(CONFIDENTIAL)~~

D. Guidance and Control Subsystems

The placement of a WS 117L vehicle on orbit requires guidance and attitude control subsystems.

The ascent to orbit is divided into three phases: (See Figure 2)

1. The powered portion from launch to booster cutoff and separation.
2. The coast to apogee on an elliptical ascent trajectory.
3. The application of the orbital boost to provide the necessary increment of velocity to place the vehicle on a desired orbit. ~~(SECRET)~~

During the powered portion of the ascent, control is accomplished by using the existing booster subsystem consisting of main engines, sustainer and tiltable verniers. During the powered ascent the control signals are derived from an autopilot to cut off and control the direction of the rocket engines in order to place the vehicle on an elliptical trajectory whose apogee is at the desired orbital altitude. This phase of the problem is similar to the guidance of a ballistic missile, although the accuracy requirements for the WS 117L application are nearly an order of magnitude

GDS (cont'd)

less stringent than the existing 107A requirements. For this phase, either the all-inertial or radio inertial types of guidance are applicable. (~~SECRET~~)

After staging, the booster (SM-65C or 68) continues uncontrolled to impact downrange, while the satellite vehicle continues coasting to orbital altitude. At this time, the orbital boost must be applied in the proper direction to place the vehicle in the desired orbit. This need for a precise direction requires an orientation reference in the vehicle, which is best met by a gyro monitored stable platform, the heart of an inertial system. This feature alone dictates the requirement for an inertial system during a portion of the ascent. The use of a radio-inertial system provides additional problems with a loss of reliability and flexibility in choice of orbit selection. Feasibility studies by Rand, North American Aviaion, Massachusetts Institute of Technology, and the three system design study contractors as well as cognizant Air Force agencies indicate that an all-inertial system is the most feasible for the ascent guidance of WS 117L. (~~SECRET~~)

The all-inertial guidance subsystem of WS 315A is scheduled to be available in time to be utilized in the WS 117L flight test program. Components from this system can be utilized with a minimum of modification in the design and construction of a complete all-inertial ascent guidance system for WS 117L. ~~(SECRET)~~

An all-inertial tactical bombing system under development is also scheduled to be available in time to furnish critical components from which a complete ascent guidance system for WS 117L can be designed and built. (~~SECRET~~)

Guidance: The vehicle guidance subsystem will establish the proper vehicle orientation during coast and the second propulsion stage with reference to a stable platform corrected by a transition computer. The guidance subsystem will provide information to initiate and cut off the orbital boost engine upon entry into orbit, whereupon the guidance subsystem will activate a programmed tipping of the orbiting vehicle to place it in its stable orientation. Attitude indication will be provided for increased accuracy of correlation for geographical loaction. (~~SECRET~~)

Flight Control: The Flight Control Subsystem will perform the following functions: (1) Control and stabilization of the booster during the first stage boost phase; (2) Control and stabilization of the satellite vehicle during the second stage powered phase; (3) Control and stabilization of the satellite during the coast phase; (4) Control and stabilization of the satellite during orbital entry; and (5) Control and stabilization of the satellite vehicle on orbit. The Flight Control Subsystem will utilize an ICBM developed ascent control system for booster control during powered phase without modification. The satellite vehicle flight control subsystem will accept commands from the guidance subsystem during ascent and orient the vehicle during coast and the third propulsion stage with reference to a preselected vehicle orientation for placing the satellite vehicle on orbit. To control and stabilize the orientation of the satellite while on orbit, a system using rate gyros for measurement and gas jets or reaction wheels for control will be employed. ~~(SECRET)~~

E. Visual Reconnaissance

Pioneer Visual System: To provide an early visual reconnaissance system, it is proposed to utilize a photographic camera with electronic readout. The film will be developed while the vehicle is passing from unfriendly territory to within range of the ground station and the image will be readout and transmitted to the ground station. The life of the system will be determined by the film and developer carried, but since the early vehicles will have battery power, the use of such a short term system appears to be appropriate. Recent film advances indicate that no more than five pounds of film per month will be required. It is estimated that a system of this type, when designed to detect 100 foot ground objects, could cover an area of 200,000,000 square miles in approximately four months of operational life. (See Figure 5) ~~(SECRET)~~

Advanced Visual System: The advanced visual system will explore in detail, ground objects and accomplish surveillance of preselected target areas. Repetitive passes over the same territory will permit mapping with an accuracy of 1/10 of a mile. ~~(SECRET)~~

A development program will be prosecuted for this system which has a capability of detecting 20 foot objects and has significantly longer life than the pioneer system. ~~(CONFIDENTIAL)~~

The approach will be along the following lines:

1. **Electrostatic Tape Method**: In this process, the image forms a pattern of electrostatic charges on a tape of insulating material. When the ground station is in range of the vehicle, the tape surface is scanned by an electron beam and the video signal transmitted. The tape is then wiped clear of all charges and re-used. ~~(CONFIDENTIAL)~~

2. **Television-Magnetic Tape Method**: In this process, the ground is examined by an image orthicon television tube and the resulting video signals stored on a magnetic tape for playback to the ground station. As in the electrostatic process, the tape is then wiped clear of signals and is re-used. ~~(CONFIDENTIAL)~~

Ultimate Visual System: The ultimate visual reconnaissance system will keep potential enemies under a daily scrutiny of an activity available to satellite observation. Automatic ground data processing will permit the collection of greater quantities of visual information. ~~(SECRET)~~

Additional development of the advanced visual system will be undertaken to improve resolution, storage devices, and such other equipments which will permit the better accomplishment of the ultimate visual mission. ~~(CONF)~~

F. Electronic Reconnaissance (Ferret)

Pioneer Ferret System: Due to the limited power which will be available (i.e. 75 - 150 watts), the earliest system will only be capable of providing frequency density information in the range of 50 - 18000 mc/s. Emitting sources operating above 1000 mc/s will be located to within 60 miles. Some information on pulse width and pulse repetition frequency will be obtained. ~~(SECRET)~~

This system will incorporate either a scanning superheterodyne or a crystal video receiver with a preamplifier using antennas directed at the horizon. Sweeping receivers with downward directing antennas will be employed. (See Figure 5) Narrow band magnetic tape recorders will be used for information storage. ~~(SECRET)~~

Advanced Ferret System: When larger quantities of power become available (i.e. 250 - 500 watts) a system covering the frequency range from 40 - 40,000 mc/s will be used to more accurately determine signal parameters and emission source location. (About 50 miles) ~~(SECRET)~~

Ultimate Ferret Systems: When a power supply of 1 - 10 kw becomes available, a more sophisticated system will be developed permitting very accurate determination of frequency, pulse width and pulse repetition frequency, and source location to within less than 30 miles. Wide band recording will enable continuous surveillance and complete identification of emitting sources by mission. ~~(SECRET)~~

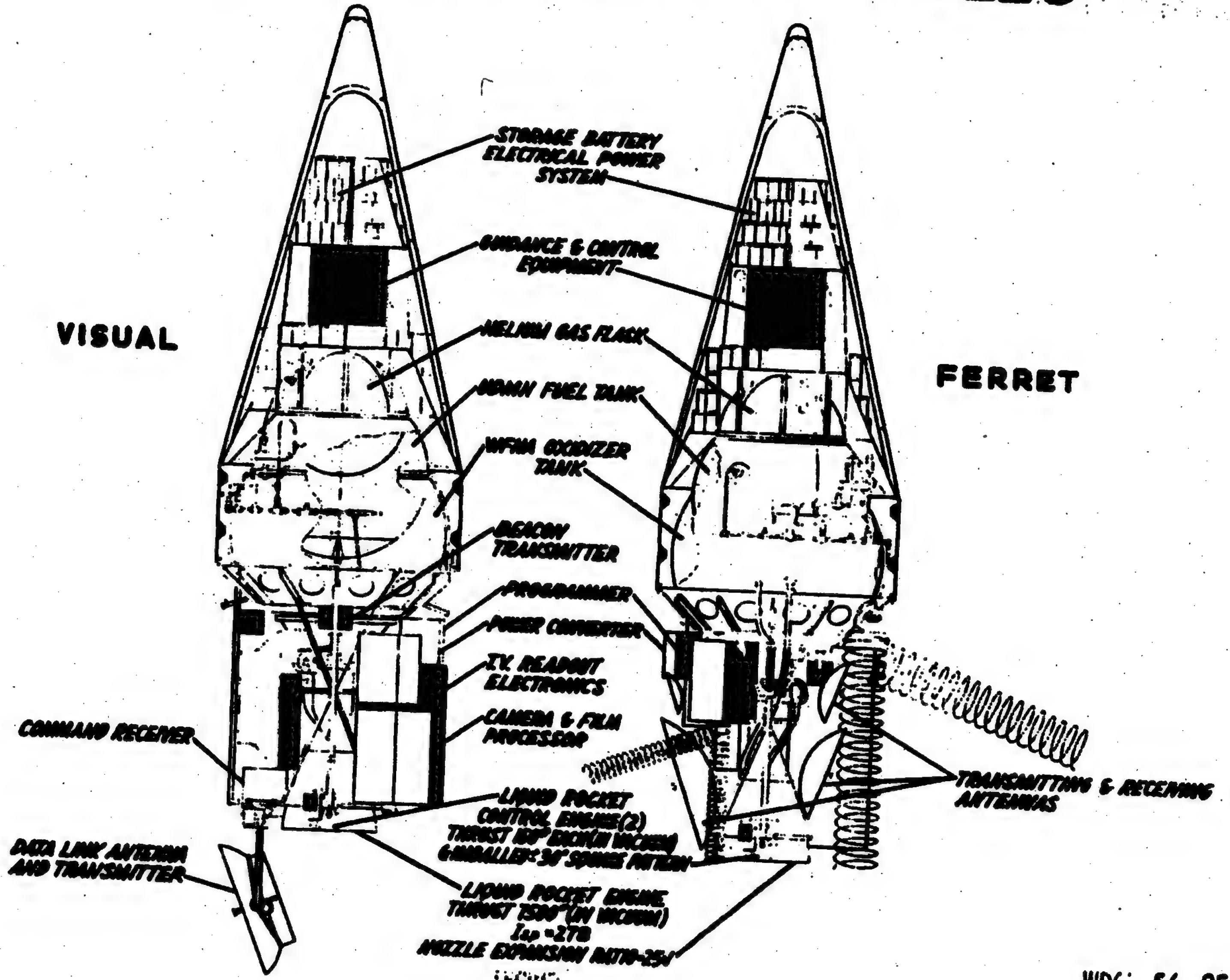
G. Infrared Surveillance

Infrared systems appear to have promise of providing early warning against aircraft and missiles. In order to have a firm basis for proceeding with the development program, it is planned to conduct an early feasibility study. Information currently available indicates that detection of exhaust plumes of large aircraft and air breathing missiles at ranges of about 400 miles is expected. An early system might consist of a linear array of about 40 cooled lead-telluride cells located at the focal point of a five foot diameter reflector provided with appropriate scanning. Storage of information would be by magnetic tape for later readout. ~~(SECRET)~~

More refined systems involving networks of satellites can be envisioned for the detection and tracking of ICBM's. However, the nature of any effort along this line under this program should await results of the AICBM Program. ~~(SECRET)~~

~~SECRET~~

PIONEER SATELLITE VEHICLES


VISUAL
FERRET
STORAGE BATTERY ELECTRICAL POWER SYSTEM
GUIDANCE & CONTROL EQUIPMENT
HELIUM GAS FLASK
HYDRAZINE FUEL TANK
WFNA OXIDIZER TANK
BEACON TRANSMITTER
PROGRAMMER
POWER CONVERTER
T.V. READOUT ELECTRONICS
CAMERA & FILM PROCESSOR
COMMAND RECEIVER
DATA LINK ANTENNA AND TRANSMITTER
LIQUID ROCKET CONTROL ENGINES (2) THRUST 10# EACH (IN VACUUM) GIMBALLED ±30° SQUARE PATTERN
LIQUID ROCKET ENGINE THRUST 1500# (IN VACUUM) Isp =278 NOZZLE EXPANSION RATIO=25:1
TRANSMITTING & RECEIVING ANTENNAS

~~SECRET~~

WDC 56-0504

Fig. 5
Page C-8a

H. Ground-Space Communications

The Ground-Space Communications Subsystem includes provision for:

1. Acquisition and tracking of the orbiting vehicle;
2. Command of the vehicle from a ground station;
3. Transmission and reception of data from the vehicle to the ground station; and
4. The necessary intra-station communications. ~~(SECRET)~~

The ground tracking or intercept stations will be located as shown in Figure 6 in time to be utilized by the first orbital test vehicles and throughout the remaining test program. The test stations located at Patrick Air Force Base, St. Lucia, Ascension, and Hawaii will provide the required acquisition and tracking information of the orbiting vehicle, data necessary for design of the orbit computer and read-out time for acquired reconnaissance data. The South-Central United States Station will serve as both an R & D prototype and an operational station. It will be used in conjunction with earliest R & D firings from AFMTC, and with both low and high inclination firings from the operational launch site (See T.S. Supplement). The final operational sites will be located as shown in Figure 6. Coordination will be accomplished so that, if at all possible, the South Central (U.S.) station will be located at the same site as the WS 117L Intelligence Center. ~~(SECRET)~~

Each operational station within the United States will contain a tracking radar (including an acquisition system), an orbit computer, a command transmitter, a reconnaissance data receiving and recording system, a telemeter receiving station, programming and timing equipment, and connections to the ground communications net. The test stations will include most, but not all, of the above equipment. ~~(CONFIDENTIAL)~~

Initially the tracking radar will be a modified SCR-584 if the AN-FPS-16 is not available, but the AN-FPS-16 will be used when available. A separate method of acquisition will be provided to insure acquisition of the vehicles. A microwave transponder-beacon will be employed in the vehicle to aid in acquisition and tracking and will utilize a frequency corresponding to the tracking radar in use. The radar-transponder link will be investigated as a possible command and telemetering link and will be used to back up the primary command and telemetering systems. The radar-transponder link will also provide a destruct command for the vehicle. ~~(CONFIDENTIAL)~~

The command link will transmit operational program commands and time signals to the vehicle. Should a directional antenna be utilized by the satellite vehicle as part of the ground-space communications link, signals for antenna orientation on subsequent passes will be transmitted over the command link. Wherever possible and when necessary, commands sent over the command link will be fed into the radar-transponder link for execution. The command link will be capable of turning on the transponder-beacon for lost-bird operation. (~~CONFIDENTIAL~~)

A ruggedized mechanical escapement type programmer will be utilized for the earlier vehicles. An improved programmer, using punched tape or some other storage technique, will be used for the more complex vehicles and, where possible, the programmer will be coupled to the vehicle's timing system. A matrix (magnetic core storage) system shows promise for the more complex operational vehicles and will be investigated. (~~CONF~~)

The timing for the early orbiting vehicles will be provided by the programmer. However, as reconnaissance data becomes available, the timing system must be of such an accuracy that there will be no degradation of the data. If investigation indicates that undue complexity will not result, a timer suitable for the final operational system will be designed and used throughout the test and operational type flights. The vehicle timing system will be synchronized with the master ground timing system when the vehicle contacts the intercept station. All the intercept stations, the WS 117L Intelligence Center, and the vehicle will be time-synchronized so that orbital and acquired data can be correlated. (~~CONFIDENTIAL~~)

The orbital computers at the intercept stations will use orbital data (radar tracking and past history) to provide future orbital data and a time-synchronized recording of the vehicle's position during its orbit. Tracking information will be forwarded from the intercept station to WS 117L Intelligence Center and correlated with similar data from the other intercept stations. This accurate time-synchronized recording of positional information will be available for future orbital and programming computations and for read-out with the time-synchronized reconnaissance data recordings. The computers at the intercept stations will not require the sophistication of the computer at the Intelligence Center, but each will be capable of growth from the initial use for early flight tests to a final operational system. (~~SECRET~~)

The space-to-ground transmission of reconnaissance data will be accomplished to furnish the maximum data commensurate with bandwidth availability. For the visual systems, simultaneous investigations will be made relative to simplicity,early availability and utility of a satellite fixed data transmitting antenna scheme as well as the more complex steerable antenna arrangement. The transmitter tube will be chosen to meet ARS reliability. The data link receiving antenna will be a large parabolic antenna slaved to the tracking radar antenna. (~~CONFIDENTIAL~~)

The ferret data link system will either be identical to the visual data transmission scheme or utilize standard telemetering techniques. (UNCLASS)

Suitable time-synchronized recording of the reconnaissance data will be performed at each intercept station, and then transmitted to the Intelligence Center. (~~CONFIDENTIAL~~)

~~SECRET~~

WS 117L GROUND STATIONS

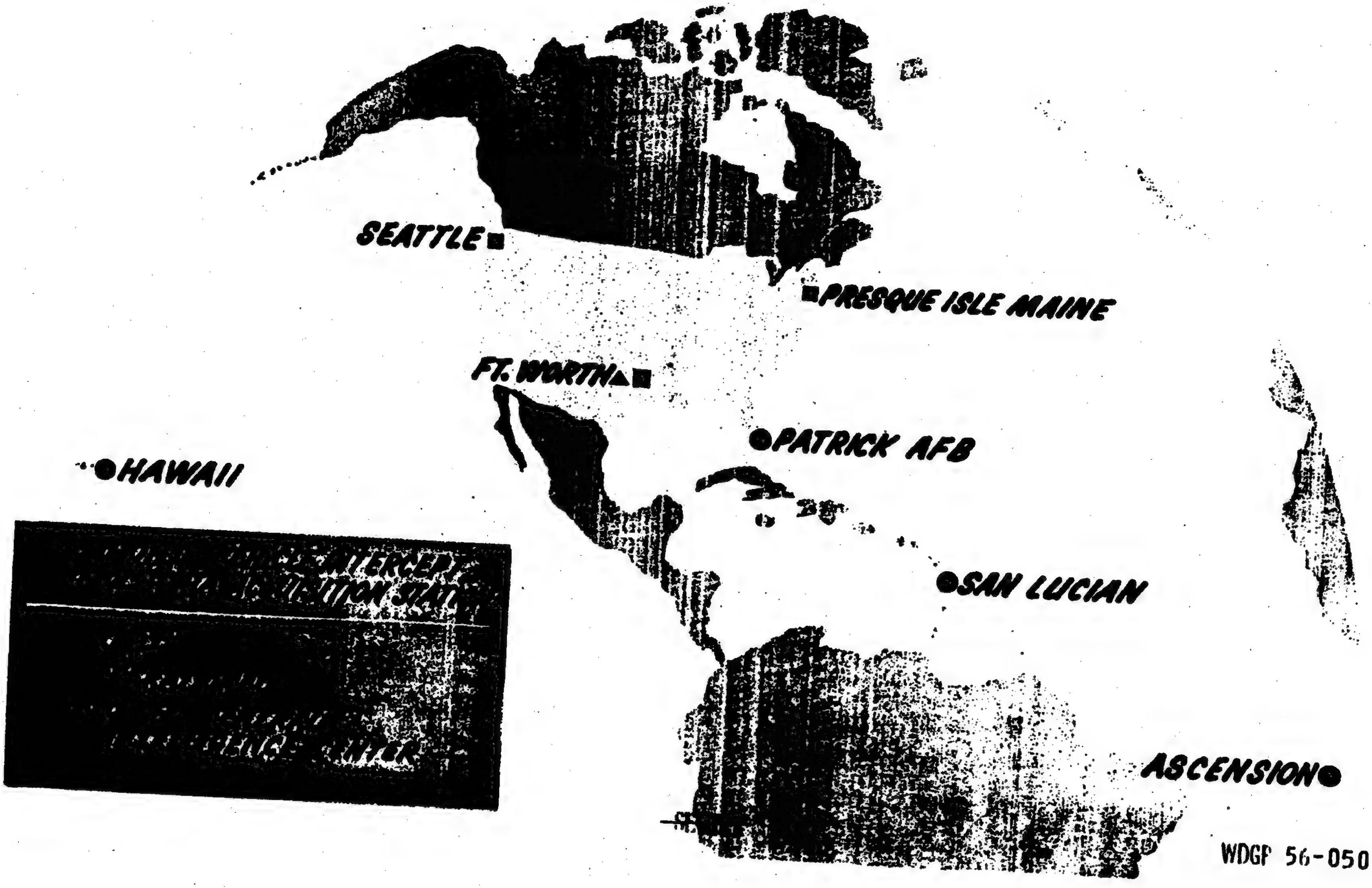


Fig. 6
Page C-10a

Ground communication facilities will be established in order to permit the rapid transmission of time-synchronized reconnaissance and orbital data from each intercept station to the Intelligence Center, the transmission of programming orders from the Intelligence Center to each intercept station, and the transmission routine information. Initially, narrow bandwidth wire and radio nets will be furnished. Wide bandwidth communications between the intercept stations and the intelligence center will be provided early enough so that at no time will the ground communication capability cause constraint in rapid data transmission. ~~(SECRET)~~

The launch station, each intercept station, and the Intelligence Center will contain the necessary intra-station communications required for efficient operation. ~~(CONFIDENTIAL)~~

It will be necessary in the early programs to provide space-to-ground telemetering as the major means of conveying vehicle instrumentation data to the ground. It will play a major role in the development cycle, and, therefore, every attempt will be made for a high order of reliability. Standard FM/FM or PWM/FM telemetering techniques will be used in the early program. More refined vehicles will contain space-to-ground telemetering equipment as part of the operational equipment. This will be necessary in order to maintain continuous contact with vehicular equipment so that adjustment and switching of critical circuits may be accomplished by ground command. Consideration will be given to a redundant telemeter transmitter and/or use of the transponder as a telemetering instrument. ~~(CONFIDENTIAL)~~

Early low latitude orbital flights will provide significant utility by virtue of the fact that ground tracking radars at Patrick AFB, St. Lucia, Ascension, and Hawaii will track a transponder in the vehicle, orbital computation methods will be tested, telemetering equipment will be utilized and possibly direct space-to-ground data transmission will be attempted. ~~(SECRET)~~

I. Data Processing and Intelligence Dissemination Subsystem

The ground data handling subsystem must be capable of accepting and rapidly processing visual, ferret and infrared data. It must insure timely dissemination of intelligence and weather information to the using agencies. The scope of activities of this subsystem is shown pictorially in Figure 7. (UNCLASSIFIED)

The development of this subsystem will be phased to provide the capability for rapidly and efficiently processing increasing quantities of data collected by improved versions of the satellite reconnaissance equipment. ~~(SECRET)~~

The initial subsystem configuration must be selected so that minimum modification to existing Air Force data handling equipment now in process of research and development is required. During the development of the subsystem, continuing emphasis must be placed on exploiting automatic techniques and determining the most effective human-machine relationships. (UNCLASS)

Throughout the development of the subsystem, authorities in the field of national intelligence and reconnaissance work will be consulted to advise on matters relating to data processing and overall intelligence information flow. The Intelligence Laboratory of the Rome Air Development Center has a group of experts as consultants, through a contract with Boston University, which includes some ten representatives from the Rand Corporation, University of Michigan, and other industrial and university research organizations. (UNCLAS)

The areas which will require development effort (listed below) with their respective functional tasks are:

1. Visual Data Processing Area

Task No. 1	Conversion
Task No. 2	Extraction
Task No. 3	Indexing
Task No. 4	Storage
Task No. 5	Display
Task No. 6	Dissemination. (UNCLASSIFIED)

2. Ferret Processing Area

Task No. 1	Conversion
Task No. 2	Analysis and Reduction Equipment
Task No. 3	Presentation Equipment. (UNCLASSIFIED)

3. Infrared Processing Area

An area covering infrared processing with supporting tasks will be added prior to the time the satellite has an infrared collection capability. ~~(SECRET)~~

4. Personnel and Training Support Area

Task No. 1	Training
Task No. 2	Qualitative Personnel Requirements
Task No. 3	Human Engineering (UNCLASSIFIED)

The following constitutes the objectives of each of the tasks within each of the areas:

1. Visual Data Processing Area

Task No. 1 - Conversion: The objective of the conversion task is to develop equipment and techniques which will automatically transform the recorded data as initially received from the satellite into a form amenable to either automatic or human interpretation. ~~(SECRET)~~

Task No. 2 - Extraction: The objective of this task is the development of equipment and techniques which: (1) render visual input data amenable to analysis in accordance with the needs of the intelligence users and (2) aid in the interpretation, analysis and synthesis of both quantitative and qualitative intelligence information on the basis of photographic and television material. (UNCLASSIFIED)

Task No. 3 - Indexing: The objective of the indexing task is to develop procedures which can be used to organize the information contained in the graphic and digital storage devices located in the WS 117L Intelligence Center. With the information properly organized, pertinent information can easily be inserted, located, withdrawn and presented for use by personnel within the WS 117L Intelligence Center. (UNCLASSIFIED)

Task No. 4 - Storage: The objective of this task is to develop equipment which can be used to store for future use information collected by the reconnaissance capability of the WS 117L System. (UNCLASSIFIED)

The information stored will be both graphic (photo maps) and digital (specific target intelligence obtained from photos and ferret intelligence). The digital information will be used in the numerical displays, and the graphic information will be used in projection displays or converted into hard copy for further analysis and dissemination. (UNCLASSIFIED)

The most important criterion for determining the types of equipment needed for storage is the time allowed for withdrawal of information once the location of information is determined by means of index. (UNCLASSIFIED)

Task No. 5 - Display: The objective of this task is to develop equipments and techniques for presenting the various forms of visual and ferret intelligence information visually in the most informative manner. Different display types will be required in the WS 117L Intelligence Center, depending upon user requirements. Basically, the display types are dependent on the jurisdictions of viewers requiring these displays. These display types can be listed as follows:

a. Command type [Very large scale (pictorial)]
b. Indicator trend type [Large scale (pictorial)]
c. Indicator trend type (Alpha Numeric)
d. Dynamic simulator and global display
e. D.F Plotter (Ferret only). ~~(CONFIDENTIAL)~~

Task No. 6 - Dissemination: The objective of this task is to establish the procedures and equipment necessary to communicate stored information (Visual, Ferret and correlated Visual-Ferret) to users in a manner requested. Users will include personnel with the WS 117L Intelligence Center as well as the National Security Council, Air Force Commands and other Government Agencies. The dissemination function of the Intelligence Center will be compatible with the future Air Force Data Handling System (Project 438L). ~~(CONFIDENTIAL)~~

2. Ferret Processing Area

Task No. 1 - Ferret Conversion Equipment: The objective of this task is to develop equipment for decoding the raw ferret data, correlating the geographic positional data with the ferret data (utilizing time indexing) and producing a single composite magnetic tape comprising the ferret intercept and associated positional data. The data on the tape will be in digital form so as to enable automatic machine manipulation for the rapid extraction of intelligence information. (UNCLASSIFIED)

Task No. 2 - Ferret Analysis and Reduction Equipment: The objective of this task is to develop equipment capable of accepting the data from the conversion equipment and process it in a form suitable to satisfy intelligence user requirements. The information contained in the data at this point will be sorted and redundant data eliminated. The equipment shall have the capability of rendering an immediate indication of activity in preselected frequency bands over specified geographical areas. (UNCLASS)

Task No. 3 - Ferret Presentation Equipment: The objective of this task is to develop equipment which will accept on demand, from the Ferret analysis computer, information and display it in a prescribed manner. The equipment to be developed under this task will include (1) Radar Order of Battle Display (2) Graphical Construction Equipment, and (3) Simulator Displays. (See Task No. 5 under Visual Data Processing Area.) (CONFIDENTIAL)

3. Infrared Processing Area: Tasks will be added as decisions on infrared development are made. (UNCLASSIFIED)

4. Personnel and Training Support Area

Task No. 1 - Training: The objective of this task is to develop equipment and techniques for training the interpreter, analyst, operator and maintenance personnel required by the ground data processing subsystem. The training problem is in many respects critical, since the large volume of data and the high rate of information flow to be generated by the ARS will impose heavy burdens upon the human element of the processing subsystem. Of special importance is the need to train photographic interpreters to extract information with considerable speed and accuracy from photographic and television images embodying various forms and degrees of degradation. Otherwise, the analysis and interpretation function may prove a major obstacle to the achievement of a large increase in the timeliness of intelligence, one of the primary goals of the ARS. (CONFIDENTIAL)

Task No. 2 - Qualitative Personnel Requirements: The objective of this task is to produce Qualitative Personnel Requirements Information (QPRI) covering all analysis, interpretation, operator and maintenance jobs called for by the ground data handling subsystem. Such information is needed to establish manpower and training requirements for the various stages of subsystem development, sufficiently far in advance of operational dates to insure the availability of an adequate number of properly trained personnel. (UNCLASSIFIED)

Task No. 3 - Human Engineering: The objective of this task is to provide all necessary human engineering support for the ground data handling subsystem. In a subsystem as complex as this, the design of equipment and the integration of components into larger units must be accomplished in a manner which takes full cognizance of human capabilities and limitations. The gains to be achieved by appropriate human engineering will include increased ease in operation and maintenance, a reduction in required time and

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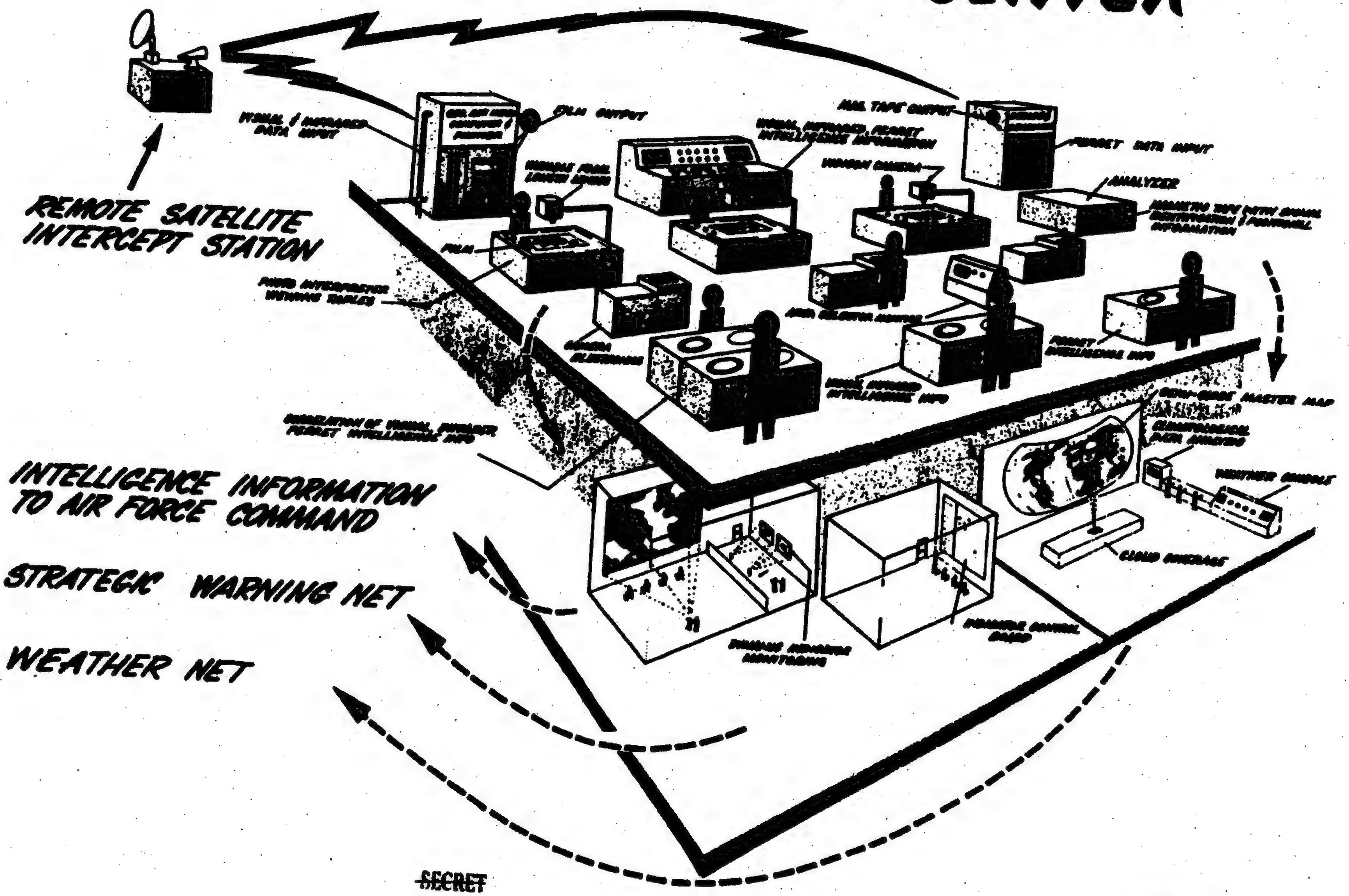
WS117L INTELLIGENCE CENTER


REMOTE SATELLITE INTERCEPT STATION
VISUAL & INFRARED DATA INPUT
FILM OUTPUT
FILM
PHOTO INTERPRETATION VIEWING TABLES
MAG TAPE OUTPUT
VISUAL, INFRARED, FERRET INTELLIGENCE INFORMATION
VIDICON CAMERA
FERRET DATA INPUT
ANALYZER
MAGNETIC TAPE WITH SIGNAL IDENTIFICATION & POSITIONAL INFORMATION
AREA SELECTOR MONITOR
FERRET INTELLIGENCE INFO
VISUAL INFRARED INTELLIGENCE INFO
CORRELATION OF VISUAL, INFRARED, FERRET INTELLIGENCE INFO
MASTER MAP
CLIMATOLOGICAL DATA ANALYSIS
WEATHER CONSOLE
CLOUD COVERAGE
INTELLIGENCE INFORMATION TO AIR FORCE COMMAND
STRATEGIC WARNING NET
WEATHER NET

~~SECRET~~

WDGP 56-0540

Fig. 7
Page C-14a

complexity of training, the more rapid extraction of visual infrared and ferret information, a speed-up in communication, and more efficient and rapid subsystem routines. (UNCLASSIFIED)

J. Ground Support and Training

1. **Ground Support**: This portion of the subsystem involves all ground items directly involved in testing and launching the orbiting vehicle. Excluded are items that are peculiar to other individual subsystems, such as particular radars, consoles, checkout equipment, components and data handling and transmission units. Under this subsystem, equipment and/or techniques will be developed as required to perform the following functions:

a. Transportation and handling of ARS Orbiting Vehicle.
b. ARS-ICBM marriage-compatability and static testing (Probably at Edwards Air Force Base).
c. ARS-ICBM assembly and final checkout (Probably at the Prelaunch-Support assembly area at Patrick Air Force Base).
d. ARS-ICBM (assembled) Transport to launcher and erection (Dependent on Technique).
e. ARS-ICBM pre-launch checkout.
f. ARS range check.
g. ARS-ICBM range timing synchronization.
h. ARS battery storage, charging and installation; or ARS nuclear power supply storage, safety checkout and installation.
i. ARS pad and range safety measures.
j. ARS fueling and pressurization storage and handling.
k. ARS vehicle measuring and instrumentation operations.
l. ARS-ICBM blockhouse operations - ARS space requirements not delineated as yet.
m. ARS-ICBM Launcher modification-flexibility of ICBM launch stand to accommodate overall vehicle length extension due to ARS addition (Approximately 15 - 30 feet). ~~(SECRET)~~

The functions and activities listed above necessitate a specific requirement for early and detailed coordination and integration with the applicable ICBM operations. (Captive test site and Pre-launch support and Launch areas.) ~~(SECRET)~~

2. **Training**: The training portion of this subsystem involves the orientation and schooling required to establish Operational and Personnel Capability potential. In view of the research and development types of endeavor prevailing in ARS during the first several years, this type of training is not immediately applicable. However, as the system reaches operational readiness, USAF or contractor personnel will be phased into training programs, both "on the job" and in courses designed to suit requirements. (UNCLASSIFIED)

K. Flight Test Subsystem

Equipment will be provided to measure accelerations, vibrations, pressures and temperatures during flight and captive tests. Strain gauges will be applied for structural measurements. Telltales will monitor operations such as stage unlatching and separation. Payload equipment will be instrumented to obtain data on component functioning and failure analysis should malfunction occur. (UNCLASSIFIED)

Both non-orbiting and orbiting test vehicles will be instrumented to obtain data on geophysical environment at and below orbiting altitude. Requirements for geophysical data will be established by the contractor. Development of required geophysical instrumentation and interpretation of geophysical data collected during flight test program will, at the discretion of the WSPO, be accomplished by AFCRC or the prime contractor. Vehicle specifications are covered in vehicle subsystem - "A. Vehicle". Consideration will be given to provision of orbiting test vehicles for the purpose of collecting geophysical data for advancement of the state of the art. (~~SECRET~~)

1.

R & D SCHEDULE

☒ SYSTEM ☐ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

3. DATE
2 April 1956

4. TITLE
WS 117L - Advanced Reconnaissance System

5. INITIAL ☒
CHANGE

6. NUMBER
WS 117L

SCHEDULE		CALENDAR YEARS																																									
TITLE	PROJECT OR TASK NR.	1958						1959												1960								1961				1962				1963				TO COMPL			
		J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Vehicle																																											
Pioneer												⇧																															
Advanced																												⇧															
Propulsion																																											
Pioneer Propulsion																																											
Ground Tests Complete		⇧																																									
Advanced Propulsion for Advanced Vehicle Ground Tests Complete																						⇧																					
Auxiliary Power Unit (Non-Orbit Flight Tested)																																											
Battery		⇧																																									
Solar																⇧																											
Nuclear																									⇧																		
Guidance and Control																																											
Pioneer Equipment												⇧																															
Advanced Equipment - meeting more stringent requirements																								⇧																			
Visual Reconnaissance																																											
Pioneer													⇧																														
Advanced																												⇧															
Electronic Reconnaissance																																											
Pioneer															⇧																												
Advanced																										⇧																	
Surveillance																															⇧												

ARDC FORM 1 JUL 55 103 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

⇧ - Dates at which time subsystem is ready for

1.

R & D SCHEDULE

☒ SYSTEM ☐ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

3. DATE
2 April 1956

4. TITLE
WS 117L - Advanced Reconnaissance System

5. INITIAL ☒
CHANGE

6. NUMBER
WS 117L

SCHEDULE		CALENDAR YEARS																																									
TITLE	PROJECT OR TASK NR	1958						1959												1960								1961				1962				1963				TO COMPL			
		J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Infrared																																											
Pioneer (if implemented -																																											
See General Design Spec.)																														⇧													
Ground-Space Communications																																											
Test Stations available for																																											
Pioneer Flights																⇧																											
Operational Stations available																								⇧																			
Data Processing and Intelligence																																											
Dissemination																																											
Initial Capability for Test																																											
with Orbiting Data Collection																	⇧																										
Interim Capability																										⇧																	
Final with Refined Equipment																																											
Enabling Semi-Automatic																																											
Processing of Large Qunatities																																											
of Data																																							⇧				
Ground Support & Training																																											
Pioneer											⇧																																
Advanced																														⇧														

ARDC FORM 1 JUL 55 103 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

⇧ Subsystem Ready for Orbital Flight or

SECRET

1.

R & D TEST ANNEX

☐ SYSTEM ☐ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE OF PAGES

3. DATE 2 April 1956

4. TITLE WS 117L - Advanced Reconnaissance System
TEST VEHICLE (NON ORBIT)

5. INITIAL ☒
CHANGE

6. NUMBER WS 117L

7. RESP CENTER	8. PROJECT OFFICER	9. SUPPORTS (Sys or Proj)	10. CONTRACTOR	11. CONTR NR	12. PRIORITY AND PREC	13. SECURITY
WDD		117L			1A	

14. ITEM NUMBER	15. * TEST ITEM	16. TEST DESCRIPTION	17. TEST AGENCY AND SITE	18. TEST ITEM AVAILABLE	19. RQD TEST COMPL DATE
1	Non Orbit Test Vehicle	Functional test of WS 117L vehicle configuration, including staging, altitude start of orbital stage, etc. Also testing of components and subsystems.	HADC and/or AFMTC and/or West Coast launch site		

* The design configuration of the non orbit test vehicle series is to be determined later. Consideration is to be given to the use of a booster and full scale vehicle versus a scale model using a solid propellant booster such as a Sargeant, also such other vehicles which can be made available and used for test such as Aerobee, etc.

TEST CENTER APPROVAL

20. NAME	ORGANIZATION	DATE
21. NAME	ORGANIZATION	DATE

RESPONSIBLE CENTER APPROVAL

22. NAME	ORGANIZATION	DATE

ARDC FORM 1 JUL 55 105 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

1.

R & D TEST ANNEX

☒ SYSTEM ☐ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE OF PAGES

3. DATE 2 April 1956

4. TITLE WS 117L - Advanced Reconnaissance System Ground-space Communications

5. INITIAL ☒ CHANGE

6. NUMBER WS 117L

7. RESP CENTER RADC

8. PROJECT OFFICER

9. SUPPORTS (Sys or Proj) 117L

10. CONTRACTOR

11. CONTR NR

12. PRIORITY AND PREC 1A

13. SECURITY

14. ITEM NUMBER	15. TEST ITEM	16. TEST DESCRIPTION	17. TEST AGENCY AND SITE	18. TEST ITEM AVAILABLE	19. RQD TEST COMPL DATE
1	Ground Intercept Control and Data Acquisition Station	Functional test of station components	*Contractor & RADC at AFMTC	April 58	March 60
2	Vehicle Electronics Exclusive of payload	Functional and evaluation tests of components	**Contractor & RADC at AFMTC	Oct 56	April 59
3	Master Orbital Computer	Functional tests with specified inputs	Contractor and RADC at WS 117L Intelligence Center	Jan 59	April 59

* Tests performed on major components of the AFMTC Ground Intercept, Control, and Data Acquisition station will constitute evaluation tests for all stations. Tests will continue from Sep 56 to Mar 59 as major components are received at AFMTC for installation.

** Test will be performed on all vehicular electronic components and assemblies exclusive of payload as they become available. Tests will be performed at AFMTC, or preferably the operational launch site (if available), and will extend from Oct 56 to Apr 59.

TEST CENTER APPROVAL

20. NAME ORGANIZATION DATE

21. NAME ORGANIZATION DATE

RESPONSIBLE CENTER APPROVAL

22. NAME ORGANIZATION DATE

ARDC FORM 1 JUL 55 105 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

1.

R & D TEST ANNEX

☒ SYSTEM ☐ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL	
PAGE OF PAGES	
3. DATE	2 April 1956
4. TITLE	WS 117L - Advanced Reconnaissance System Data Processing and Intelligence Dissemination Subsystem
5. INITIAL ☒ CHANGE	
6. NUMBER	WS 117L
7. RESP CENTER	RADC
8. PROJECT OFFICER	Russell H Johnson
9. SUPPORTS (Sys or Proj)	117L
10. CONTRACTOR	
11. CONTR NR	
12. PRIORITY AND PREC	1A
13. SECURITY	

14. ITEM NUMBER	15. TEST ITEM	16. TEST DESCRIPTION	17. *TEST AGENCY AND SITE	18. TEST ITEM AVAILABLE	19. RQD TEST COMPL DATE
1	Initial Ground Data Handling Subsystem	**Complete Data Handling Subsystem	Contractor, RADC at WS 117L Intelligence Center	1 Sep 58	31 Dec 59
2	Interim Ground Data Handling Subsystem	***Complete Data Handling Subsystem	Contractor, RADC at WS 117L Intelligence Center	1 Sep 60	31 Dec 60
3	Final Ground Data Handling Subsystem	****Complete Data Handling Sub-system	Contractor, RADC at WS 117L Intelligence Center	1 Jan 63	30 Jun 63

* The final operational site for the WS 117L Intelligence Center will be selected in FY 57 and will constitute the testing facility for the initial, interim and final Ground Data Handling Subsystem. Subsystem components will be tested at contractor's plant prior to shipment to the site.

** All communication facilities will be operational between ground intercept stations and the WS 117L Intelligence Center.

*** This Ground Data Handling Subsystem will be capable of greater handling capacity than the initial system and will include more automation. Communication facilities will be operational between ground intercept stations and the WS 117L Intelligence Center.

SECRET

TEST CENTER APPROVAL

20. NAME	ORGANIZATION	DATE
21. NAME	ORGANIZATION	DATE

RESPONSIBLE CENTER APPROVAL

22. NAME	ORGANIZATION	DATE

ARDC FORM 1 JUL 55 105 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

~~SECRET~~

1.

R & D TEST ANNEX

☒ SYSTEM ☐ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE OF PAGES

3. DATE 2 April 1956

4. TITLE WS 117L - Advanced Reconnaissance System
Data Processing and Intelligence Dissemination Subsystem (Contd)

5. INITIAL ☒ CHANGE

6. NUMBER WS 117L

7. RESP CENTER RADC

8. PROJECT OFFICER Russell H Johnson

9. SUPPORTS (Sys or Proj) 117L

10. CONTRACTOR

11. CONTR NR

12. PRIORITY AND PREC 1A

13. SECURITY

14. ITEM NUMBER	15. TEST ITEM	16. TEST DESCRIPTION	17. TEST AGENCY AND SITE	18. TEST ITEM AVAILABLE	19. RQD TEST COMPL DATE

**** This Ground Data Handling Subsystem will have the capacity to process and disseminate visual ferret and infrared data collected by a number of satellite vehicles on a continuing year around basis. Communication facilities will be operational between ground intercept stations and the WS 117L Intelligence Center.

TEST CENTER APPROVAL

20. NAME ORGANIZATION DATE

21. NAME ORGANIZATION DATE

RESPONSIBLE CENTER APPROVAL

22. NAME ORGANIZATION DATE

ARDC FORM 1 JUL 56 105 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

~~SECRET~~

WS 117L DEVELOPMENT PLAN

FACILITIES PLAN

2 April 1956

Brief descriptions of the facilites contained in this Tab are as follows:

O-1: Captive System Test Facility

Purpose: This facility provides for tests of the complete orbiting vehicle system, the propulsion and APU subsystems, and hazardous components. Captive tests simulating in-flight conditions will be accomplished. The facility will be contractor furnished and operated.

Location: It is proposed that the Captive System Test Facility can be located near the contractor's plant, or possibly at Edwards Air Force Base (ERETS).

Justification: This facility will perform hazard and propulsion tests of the WS 117L vehicle under in-flight conditions prior to actual flight tests.

F-1 and F-2: Flight Test Launching Facility.

Purpose: This facility provides the ground launch complex and support facilities necessary to achieve early orbital and non-orbital flight testing of WS 117L components and techniques.

Location: AFMTC, Florida.

Justification: Since essential support items (i.e., power, communications, etc.) and range instrumentation will be available, subsystem and system tests and low inclination flights can be accomplished. Interference with other programs will be a major point of consideration at AFMTC. The restrictions imposed on WS 117L by the AFMTC range may preclude the firing of R&D Test and Operational vehicles on high inclination orbits. This would limit the usefulness of this range for other than "system shakedown" tests.

L-1: R & D Test and Operational Launching Facility.

Note: This facility is discussed in the Top Secret Annex to the WS 117L Development Plan.

D-1 through D-4: Vehicle Tracking, Control, and Telemetry Stations.

Purpose: Assuming the use of AFMTC for the early flight testing of the WS 117L system and subsystems, four stations (one at AFMTC, plus three down range stations) are proposed. These stations will provide tracking and telemetry contact with WS 117L vehicles (non-orbiting and orbiting) or any other missile flights prior to initiation of the WS 117L launching schedule. This will provide data on the space and ground components.

Location: AFMTC, St. Lucia Island, Ascension Island, and a Pacific Ocean Area Station located to fulfill the low latitude requirement imposed by an AFMTC launch.

Justification: These stations are conceived as an optimum compromise of coverage, security, and logistic support based on the use of AFMTC as the early flight testing complex. They are required so that background can be established in the WS 117L R&D and operational problems prior to high latitude reconnaissance tests.

D-5: Vehicle Intercept, Control, and Data Acquisition Station.

Purpose: In order to fulfill the R&D Test and Operational WS 117L requirements, it is necessary to acquire, track and compute orbital paths, command program the vehicle functions, and receive the visual, ferret, and infrared data from the vehicle.

Location: South Central Continental U.S.A.

Justification: Studies have determined that a South Central U.S.A. station will provide the vehicle intercept, control, and data acquisition capability for both the early orbital flight tests conducted from AFMTC, and for later R&D test and operational flights conducted from the West Coast launch-site.

D-6 and D-7: Vehicle Intercept, Control, and Data Acquisition Station.

Note: These facilities are discussed in the Top Secret Annex to the WS 117L Development Plan.

I-1: WS 117L Intelligence Center and Training Facility.

Purpose: The Intelligence Center will process, reduce, store and evaluate the visual, ferret, and infrared data and then disseminate the resulting intelligence information to the cognizant agencies, in a usable form, for command study planning and action. It is planned that the facility, though GFE, will be operated and maintained by a nucleus of contractor personnel to provide a stable organizational structure with full exploitation of accumulated experience. Training of military and/or contractor personnel will be accomplished at this center to provide a growing complement of people trained in this unique large-scale data handling system.

Location: Studies have shown that a South Central United States location would be most feasible with regard to communications, logistics, and liaison.

Justification: Because of the unique data gathering system and the tremendous volume of information that will require processing, reduction, storage, and dissemination, an integrated Intelligence Center is mandatory.

As a general rule, the following steps in the acquisition of facilities will apply and, as such, constitute critical action dates to be used as check points on the facility acquisition schedule:

Step 1. Requirements Justification: This is a statement of what is required, when it is needed and why the particular facilities being asked for are necessary. It is prepared on the basis of information compiled by the appropriate technical groups of WDD and participating centers. (UNCLASSIFIED)

Step 2. Method of Acquisition and/or Selection of Contractor: This step is required when no contract has previously been in existence. Normally the cycle of RFP and evaluation is followed. These first two steps may at times be interchanged. (UNCLASSIFIED)

Step 3. Preparation of Criteria and/or Formal Application (Based on AFPI 70-249): This is a detailed justification by the contractor or other using agency indicating what is needed to do the job (schedule, costs, and plan). (UNCLASSIFIED)

Step 4. Notice to Proceed: This is the initial authority to the contractor to allow him to proceed with the facility acquisition. This includes issuance of design guidance by the AF for design of items funded by P-300 funds. (UNCLASSIFIED)

Step 5. Selection of A and E: This is the selection of an architectural and engineering firm to design the facility. It is accomplished by the contractor or construction agent. In the case of P-131 funded equipment, this step is a Request for Bids. (UNCLASSIFIED)

Step 6. Preliminary Drawings: This step consists of the submission for approval of preliminary drawings and specifications of the item. An actual control estimate based upon these preliminaries is submitted as the basis for funding action. In the case of P-131 equipment, this step is Evaluate Bids. (UNCLASSIFIED)

Step 7. Final Drawings: The A and E submits for approval the final drawings and specifications. Approval authorizes the prime contractor or construction agency to proceed with selection of a construction contractor. For P-131 equipment, this step is Selection of Successful Bidder and Issuance of Purchase Order, where appropriate. (UNCLASSIFIED)

Step 8. Construction Contract Award: This occurs after approval of the final drawings and advertising for bid for the construction of the item. A period of time after advertising for bid is required, but award of the contract should normally be made within a week of receiving the bids. For equipment funded with P-131 funds, this step is Delivering of Equipment for acceptance inspection and installation. (UNCLASSIFIED)

Step 9. Beneficial Occupancy Date and/or Construction or Procurement Complete: Facility activation may have started before this date, but normally is considered to start at this time. A period of time will usually elapse before the facility can be used for the purpose for which intended. It is considered as shakedown time. For P-131 equipment, this step indicates installation is complete, followed by shakedown when appropriate. (UNCLASS)

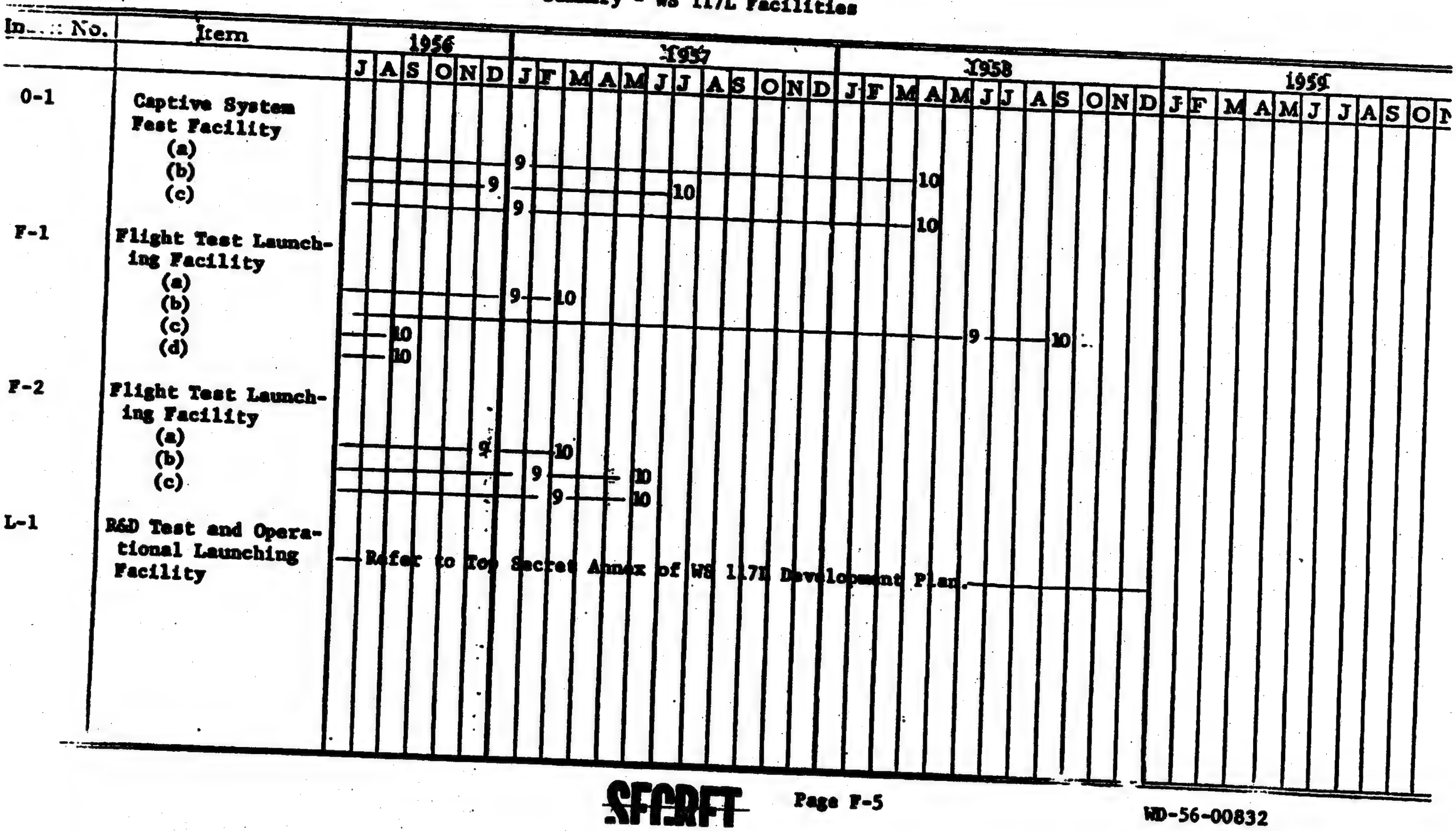
Step 10. Activation Complete: Facility or equipment is usable for purpose for which designed. (UNCLASSIFIED)

WS 117L DEVELOPMENT PLAN

Dated: 2 April 1956

FACILITIES PLAN

Summary - WS 117L Facilities



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WS 117L DEVELOPMENT PLAN

Dated: 2 April 1956

FACILITIES PLAN

Summary - WS 117L Facilities

Index No.	Item	1956						1957												1958												1959									
		J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O
	Ground-Space Communications Station																																								
D-1	AFMTC Station																						9						10												
D-2	St. Lucia Island Station																											9				10									
D-3	Ascension Island Station																											9				10									
D-4	Pacific Ocean Area Station																												9						10						
D-5	So. Central Continental U.S. Station																												9						10						
D-6	N.W. Continental U. S. Station				Refer to Top Secret Annex of WS 117L Development Plan																																				
D-7	N.E. Continental U. S. Station				Refer to Top Secret Annex of WS 117L Development Plan																																				
I-1	WS 117L Intelligence Center & Training Facility																			9																	10				

WS 117L DEVELOPMENT PLAN

SUBSYSTEM: This facility will service all subsystems providing in-flight tests while statically ground ~~INDEX NUMBER:~~ retained. The propulsion and auxiliary power subsystems will be tested at this facility. ~~INDEX NUMBER:~~ 0-1

ITEM: ~~Captive System Test Facility~~

USING AGENCY: WS 117L Contractor

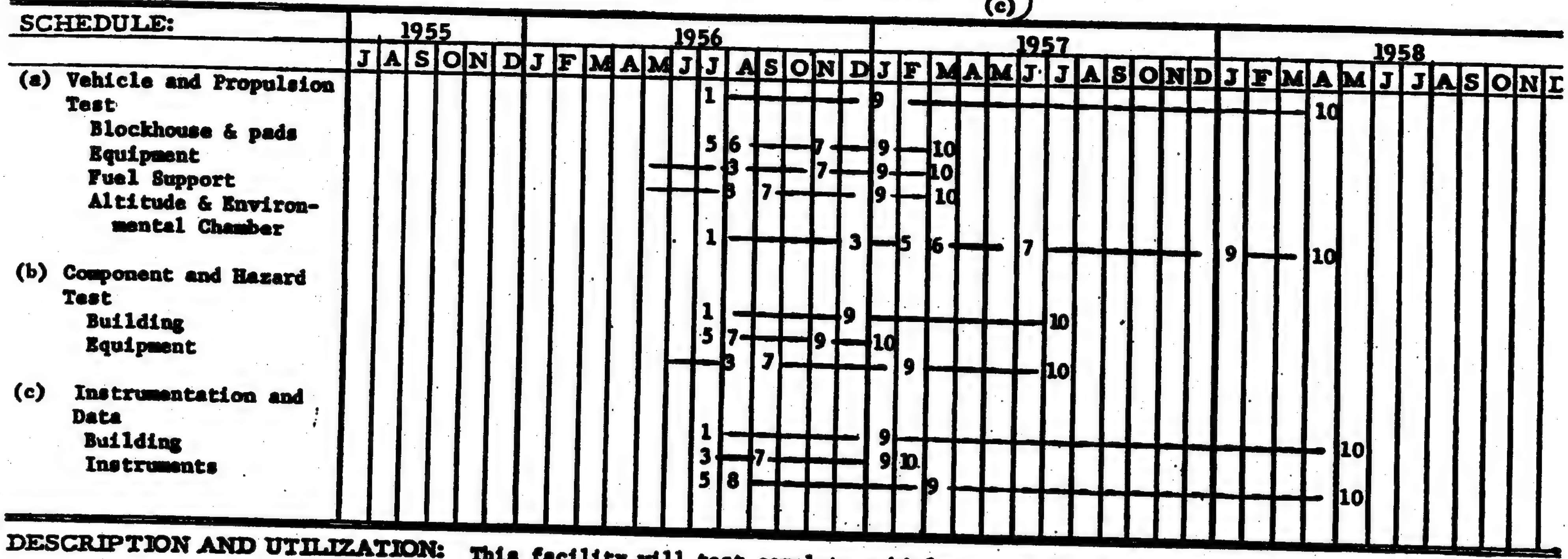
DATE: 2 April 1956

LOCATION: Contractor's Plant

BUDGET CONTROL ESTIMATE: FY 57 - P131

NEED DATE: (a) (b) (c) - January 1957

SCHEDULE:



DESCRIPTION AND UTILIZATION: This facility will test complete vehicles under "in-flight" conditions while ground retained. Hazard and propulsion tests will be performed under control conditions including auxiliary power units, subjected to various radiation effects.

REMARKS: This facility being a hazard and security unit will be given careful scheduling and design evaluation.

SECRET

This facility will service all subsystems requiring track, control and telemetry data

INDEX NUMBER: F-1

DATE: 2 April 1956

ITEM: Flight Test Launching Facility

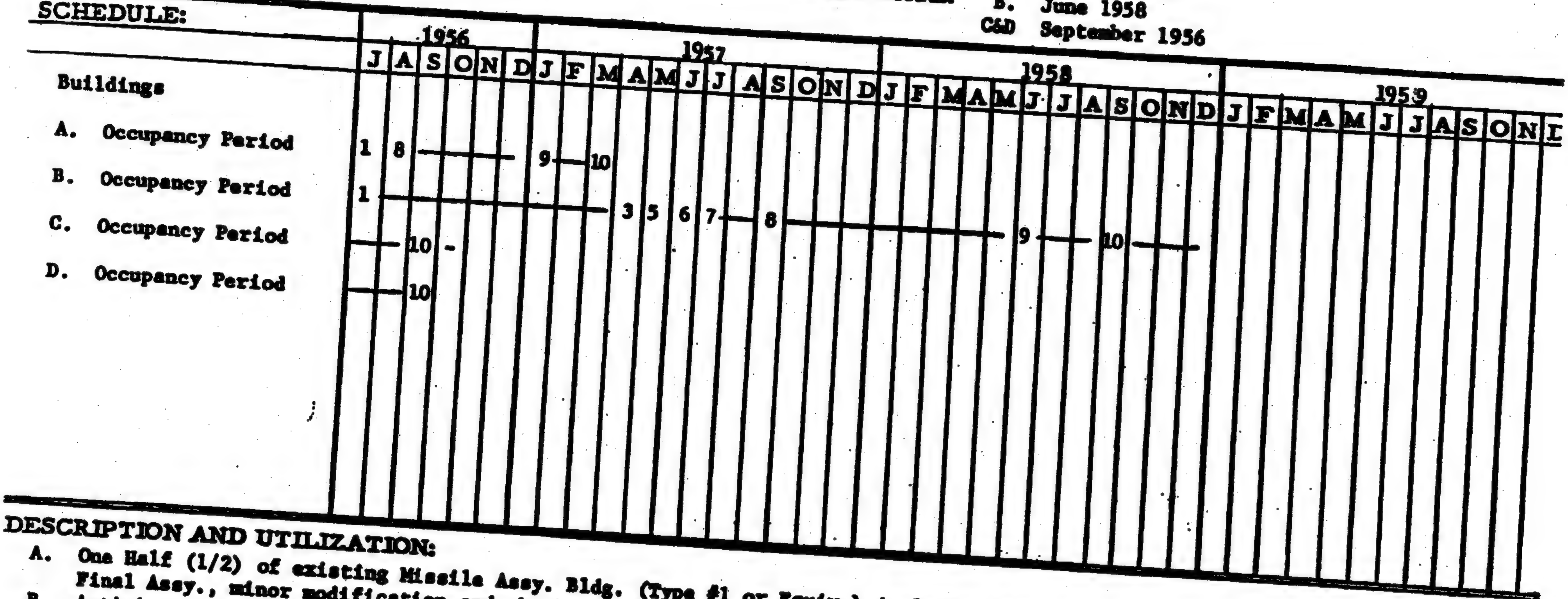
LOCATION: AFMTC, Florida

USING AGENCY: WS 117L Contractor

BUDGET CONTROL ESTIMATE: GFE & FY 57 P-300

NEED DATE:
A. January 1957
B. June 1958
C&D September 1956

SCHEDULE:



DESCRIPTION AND UTILIZATION:

A. One Half (1/2) of existing Missile Assy. Bldg. (Type #1 or Equiv.) including 5000 sq. ft. hard top storage ramp. For Final Assy., minor modification and checkout of test vehicles.
B. Anticipated separate facility for handling of hazardous systems.
C. One (1) Igloo in rocket storage area (for rockets)
D. One Half (1/2) Igloo in rocket storage area (for igniters and squibs).
For storage of T-65 booster rockets, destruct packages, igniters and squibs.

REMARKS: Present AFMTC facilities will be utilized until January 1957. HAFB, N.M. can be utilized as an alternative Flight Test Launching Facility.

SECRET

SECRET

[illegible] This facility will service all subsystems requiring track, control and telemetry data.

INDEX NUMBER: F-2

WS 117L DEVELOPMENT PLAN

DATE: 2 April 1956

LOCATION: AFMTC, Florida

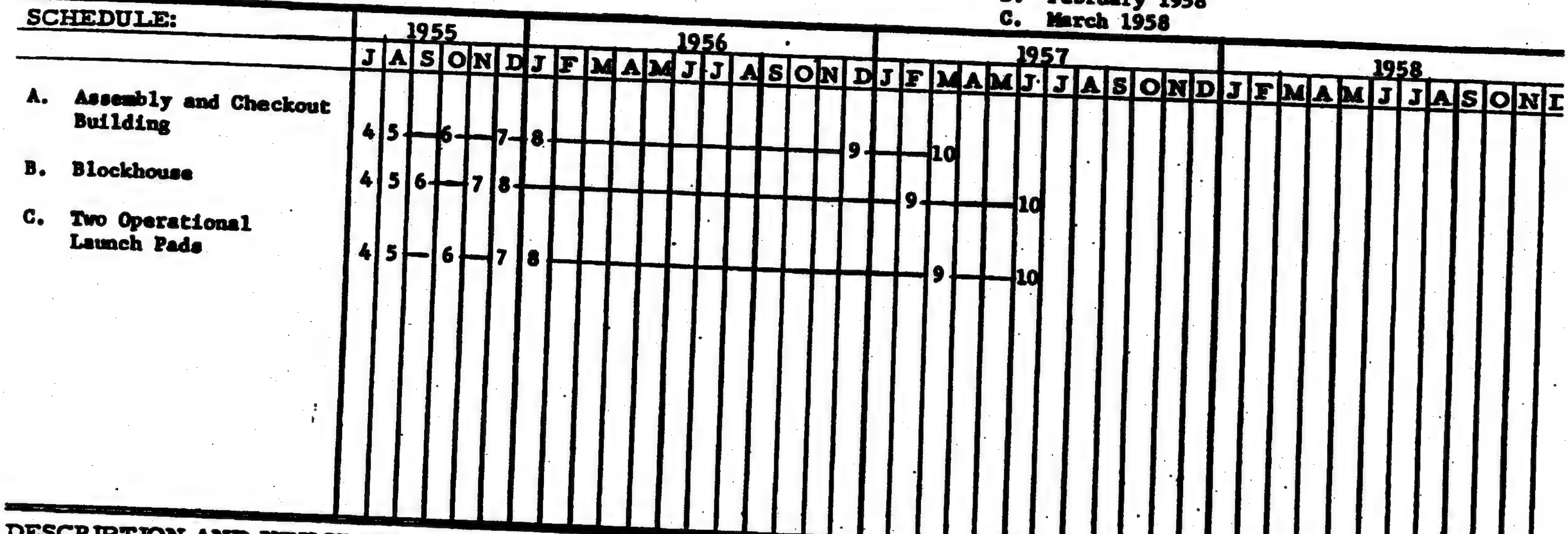
ITEM: Flight Test Launching Facility

BUDGET CONTROL ESTIMATE: GFE & FY 56 P-300

USING AGENCY: WS 117L Contractor

NEED DATE:
A. December 1957
B. February 1958
C. March 1958

SCHEDULE:



DESCRIPTION AND UTILIZATION: Complex consists of common control and data collection center (blockhouse) serving two launching sites, each having both captive and launch test capability. Included are such essential support items as servicing apparatus, instrumentation and control mechanisms. Final adjustments must be capable of being made on the stand, thus requiring access platforms and upper level facilities (air, power, communications, etc.) over and above that available on the standard ICBM stand. Between activation date and WS 117L need date, the Stands will be used to back up the WS 107A program.

REMARKS:

SECRET

~~SECRET~~

WS 117L DEVELOPMENT PLAN

SUBSYSTEM: This facility will service all subsystems requiring reconnaisance and telemetry data.

INDEX NUMBER: L-1

DATE: 2 April 1956

ITEM: R&D Test and Operational Launching Facility

LOCATION: West Coast Launching Site

USING AGENCY: USAF and WS 117L Contractor

BUDGET CONTROL ESTIMATE: *

NEED DATE: *

SCHEDULE:

	1955						1956												1957												1958											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	
* See Remarks																																										

DESCRIPTION AND UTILIZATION:

REMARKS: * This facility is contained in the Top Secret Annex to the WS 117L Development Plan.

~~SECRET~~

WS 117L DEVELOPMENT PLAN

SUBSYSTEM: Ground-Space Communications

INDEX NUMBER: D-1

ITEM: Vehicle Tracking, Control, and Telemetry Station

USING AGENCY: USAF and Contractor

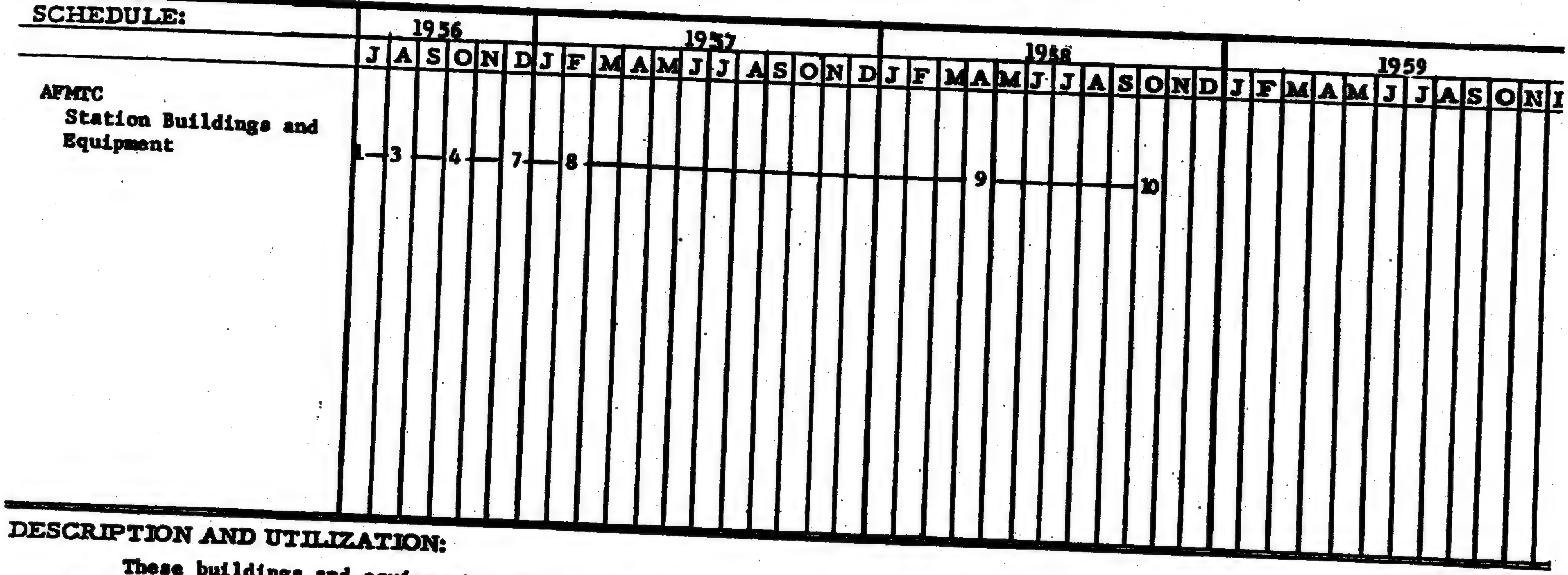
DATE: 2 April 1956

LOCATION: One Complete Station (AFMTC)

BUDGET CONTROL ESTIMATE: FY 57 - P300

NEED DATE: April 1958

SCHEDULE:



DESCRIPTION AND UTILIZATION:

These buildings and equipment constitute the AFMTC Vehicle Tracking, Control, and Telemetry station during the R&D and early test phase of the WS 117L program. The space and ground component tests will be carried out in conjunction with WS 107A and other missile flights prior to initiation of the WS 117L launching schedule.

REMARKS:

WS 117L DEVELOPMENT PLAN

SUBSYSTEM: Ground-Space Communications

INDEX NUMBER: D-2

DATE: 2 April 1956

ITEM: Vehicle Tracking, Control, and Telemetry Station

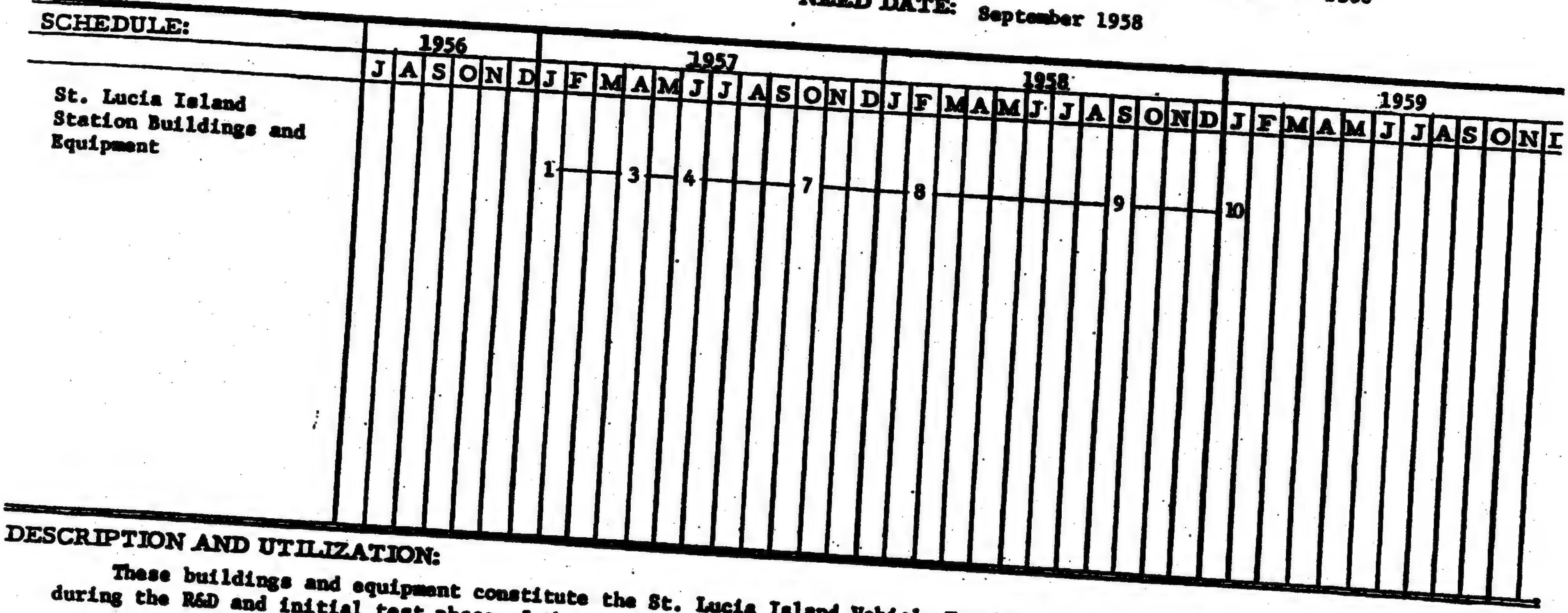
LOCATION: One Complete Station (St. Lucia Island)

USING AGENCY: USAF and Contractor

BUDGET CONTROL ESTIMATE: FY 57 - P300
FY 58 - P300

NEED DATE: September 1958

SCHEDULE:



DESCRIPTION AND UTILIZATION:

These buildings and equipment constitute the St. Lucia Island Vehicle Tracking, Control, and Telemetry station during the R&D and initial test phase of the WS 117L program.

REMARKS:

WS 117L DEVELOPMENT PLAN

SUBSYSTEM: Ground-Space Communications

DATE: 2 April 1956

INDEX NUMBER: D-3

LOCATION: One Complete Station (Ascension Island)

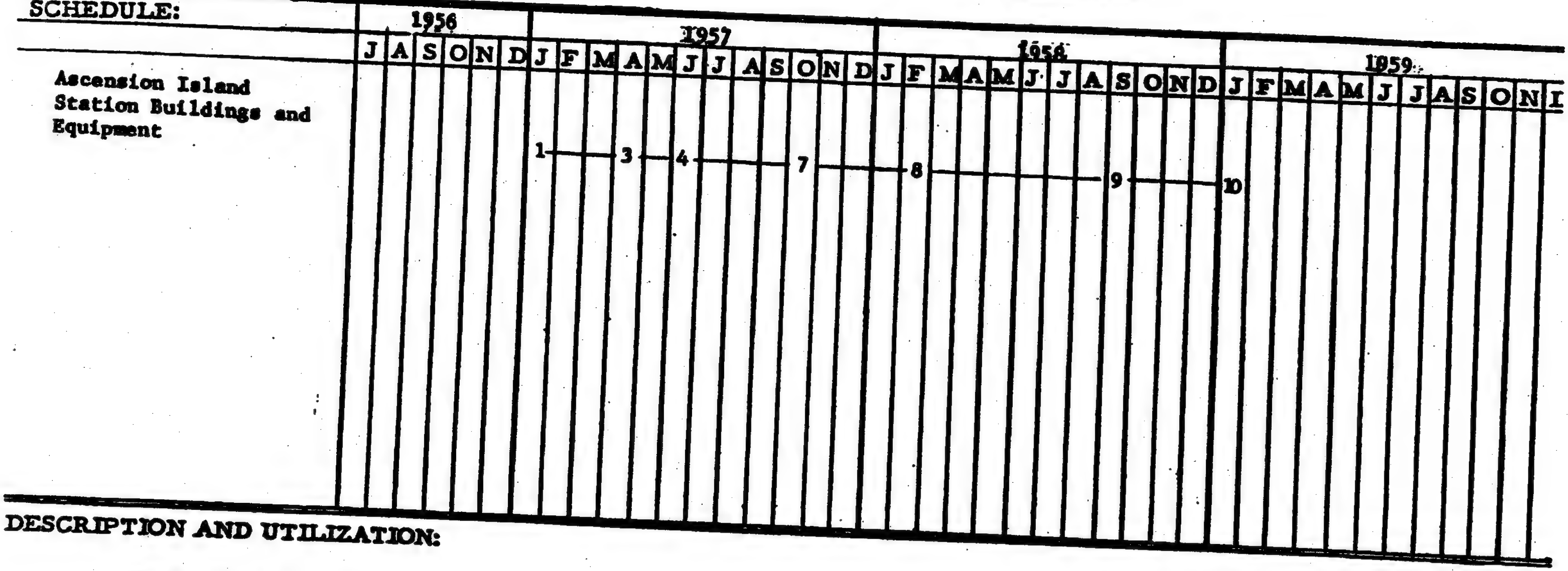
ITEM: Vehicle Tracking, Control, and Telemetry Station

BUDGET CONTROL ESTIMATE: FY 57 - P300
FY 58 - P300

USING AGENCY: USAF and Contractor

NEED DATE: September 1958

SCHEDULE:



DESCRIPTION AND UTILIZATION:

These buildings and equipment constitute the Ascension Island Vehicle Tracking, Control, and Telemetry station during the R&D initial and test phase of the WS 117L program.

REMARKS:

WS 117L DEVELOPMENT PLAN

SUBSYSTEM: Ground-Space Communications

INDEX NUMBER: D-4

ITEM: Vehicle Tracking, Control, and Telemetry Station.

USING AGENCY: USAF and Contractor

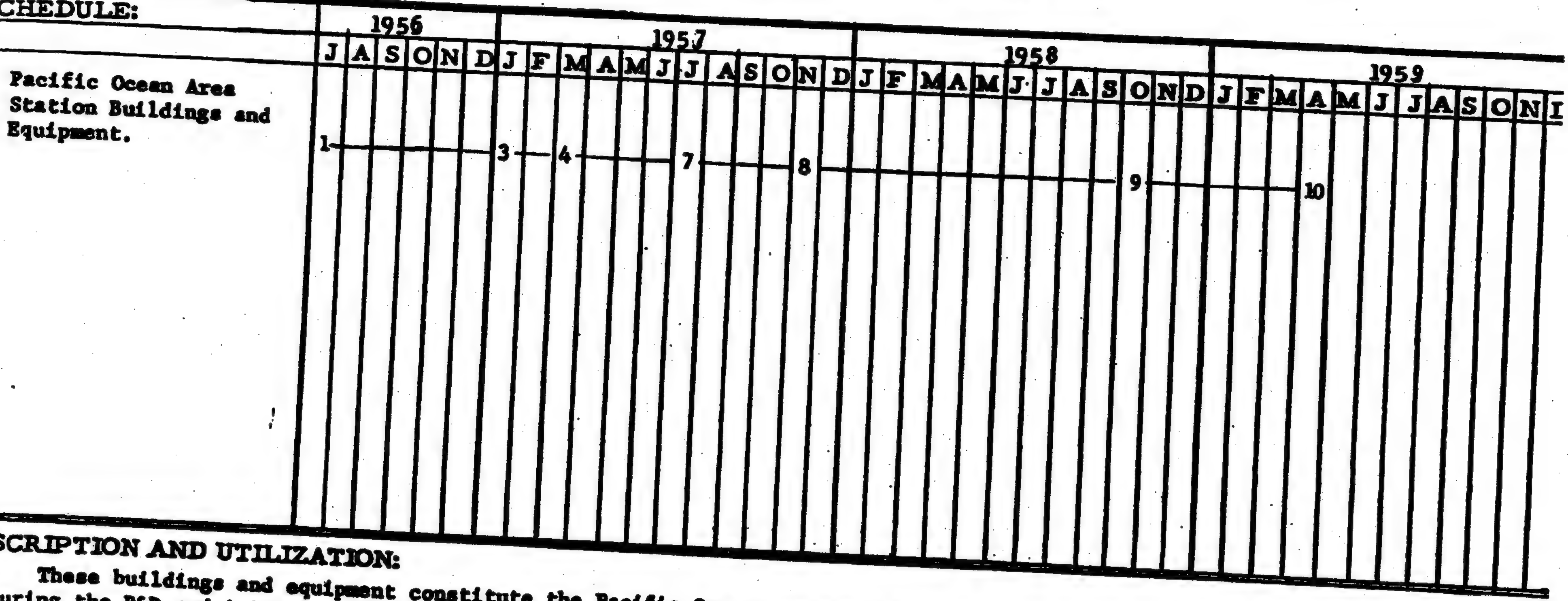
DATE: 2 April 1956

LOCATION: One complete station (Pacific Ocean Area)

BUDGET CONTROL ESTIMATE: FY 57 - P300
FY 58 - P300

NEED DATE: October 1958

SCHEDULE:



DESCRIPTION AND UTILIZATION:

These buildings and equipment constitute the Pacific Ocean area Vehicle Tracking, Control, and Telemetry Station during the R&D and initial test phase of the WS 117L program.

REMARKS:

WS 117L DEVELOPMENT PLAN

SUBSYSTEM: Ground-Space Communications

DATE: 2 April 1956

INDEX NUMBER: D-5

LOCATION: One complete Station
(South Central Continental United States)

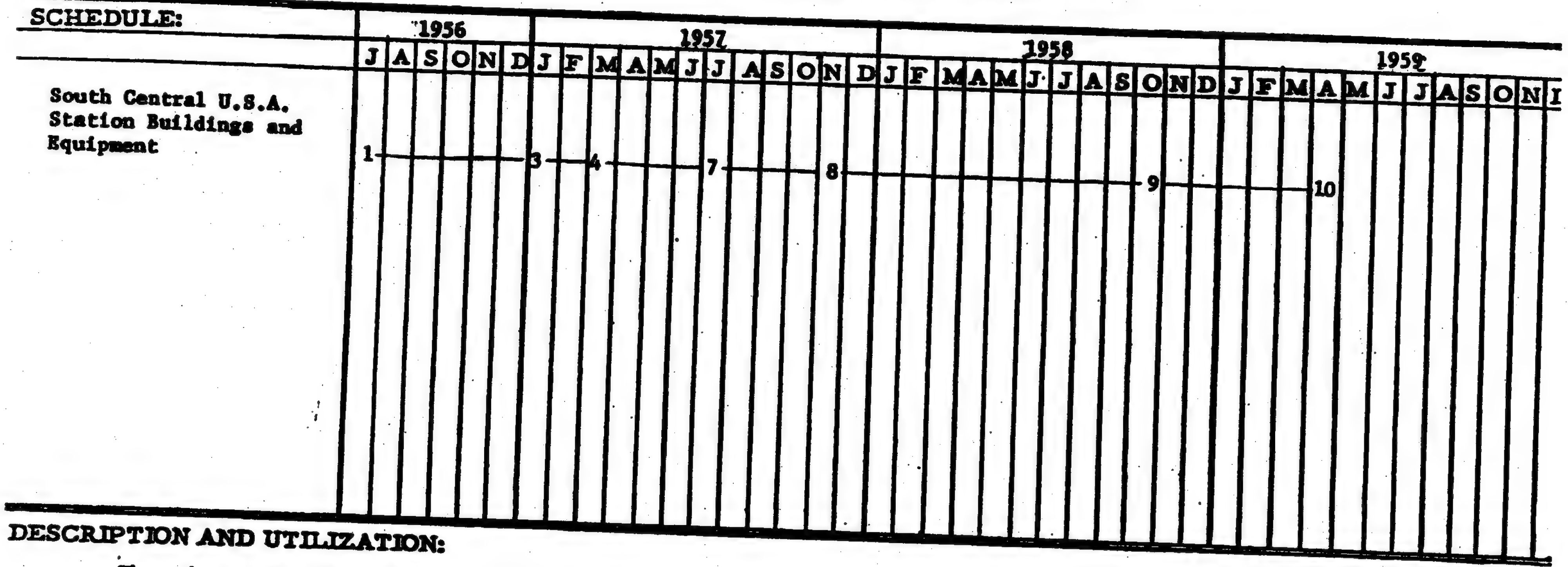
ITEM: Vehicle Intercept, Control, and Data Acquisition Station

BUDGET CONTROL ESTIMATE: FY 57 - P300
FY 58 - P300

USING AGENCY: USAF and Contractor

NEED DATE: October 1958

SCHEDULE:



DESCRIPTION AND UTILIZATION:

These buildings and equipment constitute the South Central U.S.A. Vehicle Intercept, Control, and Data acquisition station during the R&D and early test phases of the WS 117L program. This station provides the same capability during later R&D and operational test phases of the WS 117L Program.

REMARKS:

~~SECRET~~

SUBSYSTEM: Ground-Space Communications

INDEX NUMBER: D-6

WS 117L DEVELOPMENT PLAN

DATE: 2 April 1956

ITEM: Vehicle Intercept, Control, and Data Acquisition Station.

LOCATION: One Complete Station (Northwest Continental U.S.)

USING AGENCY: USAF and WS 117L Contractor

BUDGET CONTROL ESTIMATE: *

NEED DATE: *

SCHEDULE:

	1955						1956												1957												1958										
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
Northwest Continental U.S. Station Buildings and Equipment. *																																									

DESCRIPTION AND UTILIZATION:

REMARKS: * This facility is contained in the Top Secret Annex to the WS 117L Development Plan.

~~SECRET~~

SUBSYSTEM: Ground-Space Communications

WS 117L DEVELOPMENT PLAN

DATE: 2 April 1956

INDEX NUMBER: D-7

LOCATION: One Complete Station (Northeast
Continental U.S.)

ITEM: Vehicle Intercept Control, and Data
Acquisition Station

BUDGET CONTROL ESTIMATE: *

USING AGENCY: USAF and WS 117L Contractor

NEED DATE: *

SCHEDULE:

	1955						1956												1957												1958										
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
Northeast Continental U.S. Station Buildings and Equipment. *																																									

DESCRIPTION AND UTILIZATION:

REMARKS: * This facility is contained in the Top Secret Annex to the WS 117L Development Plan

SECRET

SUBSYSTEM: This Facility supports the Data Processing and Intelligence Dissemination Subsystems.

WS 117L DEVELOPMENT PLAN

DATE: 2 April 1956

INDEX NUMBER: I-1

LOCATION: South Central United States

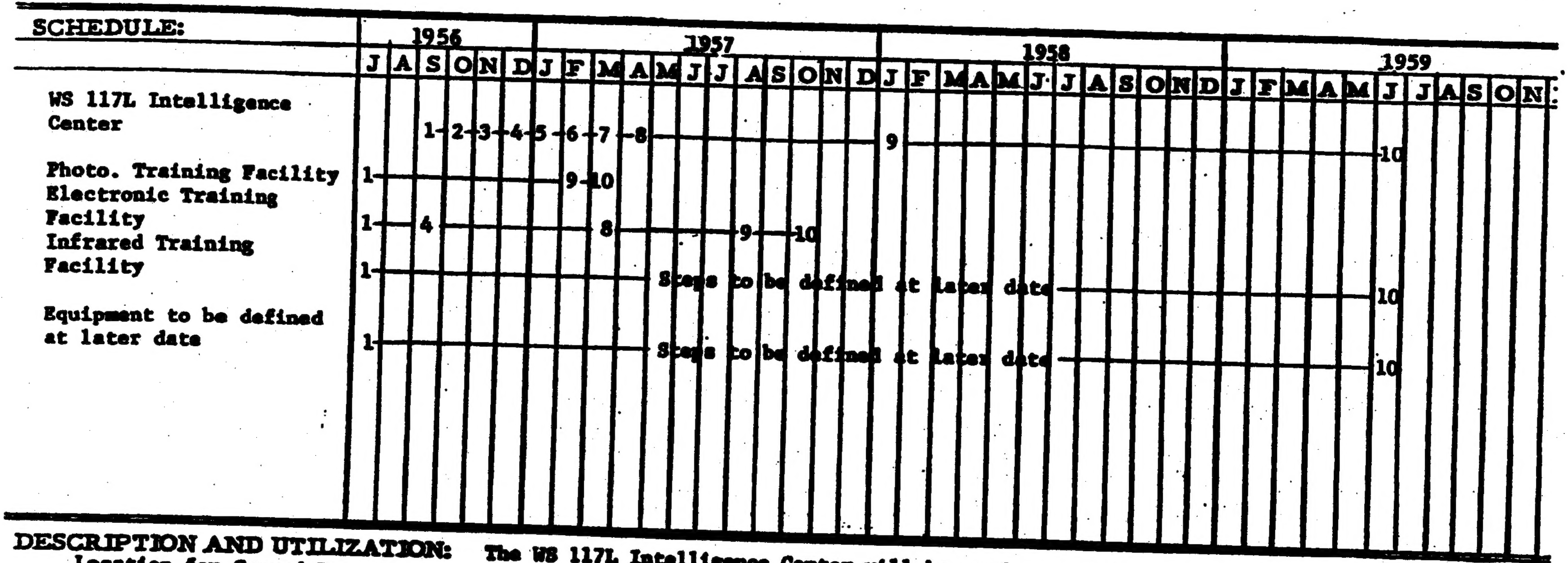
ITEM: WS 117L Intelligence Center and Training Facility

BUDGET CONTROL ESTIMATE: FY 57 - P 300

USING AGENCY: WS 117L Contractor and USAF

NEED DATE: January 1958

SCHEDULE:



DESCRIPTION AND UTILIZATION: The WS 117L Intelligence Center will be used as a Subsystem Development Facility Location for Ground Data Processing and Intelligence Information dissemination. Upon completion of the subsystem development, it will be the Operations Center for conversion of all visual, electronic and infrared data to evaluated intelligence for Command study, planning and action. The photo training facility will require space for approximately 1800 photo interpreters, specialists and correlators. The electronic training facility will require space for approximately 1200 data analyzers and interpreters. The infrared training facility space requirements are not defined at this time.

REMARKS: Estimate includes Electronic Training Facility and Photo Training Facility.

SECRET

WS 117L DEVELOPMENT PLAN

2 April 1956

PROGRAM COST ESTIMATES

The R&D Contract Funds Annex includes both prime and subcontractor costs for the development effort, research and engineering, fabrication and assembly, test operations, and project direction. It also includes those items of center support which are properly chargeable to systems funds.

The Annex does not include the following items:

1. Costs of follow-on programs. Cost summaries stop at that point where a specific capability will be generated. A continuing program to take advantage of increments in operational capability will entail additional costs.
2. Costs of training of personnel and all other associated costs of the operational Advanced Reconnaissance System.

In connection with the R&D Contract Funds Annex, it should be noted that if funds indicated for FY 1956 are not made available, the funding requirement for FY 1957 must be increased by the amount of any such deficit.

Estimates for facility and installation requirements will be available in the near future.

R&D CONTRACT FUNDS ANNEX

ADVANCED RECONNAISSANCE SYSTEM - WS 117L

SUBSYSTEM	FY 1956		FY 1957		FY 1958		TOTALS	
	P600	OTHER	P600	OTHER	P600	OTHER	P600	OTHER
1. Vehicle (including boosters)	-	3.5	3.4	3.0	6.6	16.0	10.0	22.5
2. Propulsion	.5	-	1.0	2.0	-	3.7	1.5	5.7
3. Auxiliary Power Unit	1.0	-	1.1	-	3.0	.4	5.1	.4
4. Guidance and Control	1.0	-	2.0	-	2.0	4.1	5.0	4.1
5. Visual Reconnaissance	-	-	3.1	-	4.0	4.1	7.1	4.1
6. Electric Reconnaissance	-	-	.8	-	.8	.9	1.6	.9
7. Infrared	-	-	.5	-	.9	-	1.4	-
8. Ground-space Communication	1.0	-	.4	9.0	-	16.8	1.4	25.8
9. Data Processing and Intelligence Dissemination	-	-	3.8	-	3.7	4.1	7.5	4.1
10. Ground Support and Training	-	-	-	2.0	-	4.5	-	6.5
TOTAL	3.5	3.5	16.1	16.0	21.0	54.6	40.6	74.1